



The Modern Equine Vet

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Timing Essential: Collecting, Shipping Ovaries

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Over His Face**

**4 Tips for Bandaging
Equine Limbs**

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Pleuropneumonia:
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Is the Horse Naughty, or Is It Actually in Pain?

Owners, riders and trainers often don't recognize signs of pain seen when horses are ridden. As a result, problems are labeled as training- or rider-related behavior or even normal behavior for that horse.

Some lameness is so subtle that even veterinarians can have trouble recognizing it, but developing a practical tool for recognizing facial expressions, similar to that of a body condition score chart, could dramatically improve the health and welfare of all horses, according to **Sue Dyson**, MA, Vet MB, PhD, DEO, FRCVS, head of Clinical Orthopaedics at the Animal Health Trust.

Pain-related problems are often disregarded, the horse continues in work, and the problem gets progressively worse. If pain goes unrecognized for too long, problems become too advanced to stop, or managed as well as they might have been if spotted sooner. Dr. Dyson and her team developed an ethogram for professionals and owners to help them identify signs of pain from a horse's facial expressions when being ridden, she said.

Written All Over His Face

The ethogram is a catalogue of facial expressions including the ears, eyes, nose, muzzle, mouth and head position. Each body part can display an expression that may be normal, or reflect pain, conflict behavior or distress. Most people know not to walk behind a horse in case they get kicked. Some people may be cautious when a horse puts its ears back, because this may indicate that the horse is not happy with the situation. However, very few people could describe a horse's expression or behavior when it is in pain when ridden, which is why this ethogram is so vital, she said.

In its first stage of testing, the ethogram was successfully applied by a variety of people from different backgrounds to a selection of photographs of horses' heads while they were ridden. Using the ethogram, these individuals could identify different expressions in each horse, such as the position of the ears, changes in the eyes, and tightness in the muzzle. The results were highly repeatable among



Courtesy of The Animal Health Trust

Signs of pain include partially closed eyes, ear position and opening of the mouth.

the analysts proving that, with guidance from the ethogram, individuals could potentially reliably recognize different expressions in their horse's face.

Reading Body Language

Stage two tested whether the ethogram could be used to distinguish between sound and lame horses. During this phase, a pain score from 0–3 was applied to each facial expression (mouth, eyes, ears etc.), and then totaled to determine an overall pain score for each horse. Five hundred and nineteen photos of horses that had been categorized by Dr. Dyson to be lame or sound were assessed. A total of 27,407 facial markers were recorded, with results showing that there was a statistically

significant difference in pain scores given by the assessor for clinically lame and sound horses. The facial markers showing the greatest significant difference between lame and sound horses included ears back, tipping of the head, eyes partially or fully closed, tension around the eye, an intense stare, an open mouth with exposed teeth and being severely above the bit. To further prove the effectiveness of assessing pain in a horse with the facial expressions ethogram, a selection of lame horses underwent lameness assessment and nerve blocking to alleviate the pain causing them discomfort when ridden. Comparison of their facial expressions before and after using local analgesia showed a significantly lower pain score once the lameness pain had been removed.

By focusing on the face, Dr. Dyson has proved not only that it is a clear indicator of pain, but also that even lay people can successfully tell when their horse is in pain.

MeV

Watch an interview with Dr. Sue Dyson about animal welfare



Click here to watch video



Timing Essential When Collecting, Shipping Ovaries

When a mare dies unexpectedly, harvesting her oocytes for reproduction is gaining in popularity

B y C a r o l j e a n E l l i s

Today's equine veterinarian can rescue the genetics of a broodmare, thus helping owners preserve the reproductive and emotional value of their mare. But timing is the key to success.

"The field of equine reproduction has advanced within the past

decade, offering horse owners a better prospect of salvaging the genetic worth of mares that die unexpectedly," explained **Jennifer N. Hatzel**, DVM, MS, DACT.

When Dr. Hatzel is on the phone with a referring veterinarian interested in shipping ovaries, she first



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Step by Step: How to Remove Ovaries Postmortem

STEP 1 Make a 15-cm longitudinal skin incision halfway between the hip and last rib, similar to what is done when performing a flank laparotomy. The incision should be large enough to fit one arm and hand but not so large that the veterinarian is fighting large bowel attempting to escape.



STEP 2 Continue the incision through both the external and internal abdominal oblique muscles. Once the incision is through the muscle layers, use a gloved hand to bluntly puncture the peritoneum entering into the abdominal cavity. Be careful to avoid puncturing bowel, as contact with any GI material can contaminate the entire procedure, leading to failure.



Photos courtesy of Dr. Hatzel

stresses the importance of timing. “We can’t emphasize that point enough,” she said, “because the environment surrounding these ovaries decomposes rapidly, ultimately harming oocyte quality.”

Elaine M. Carnevale, DVM, MS, PhD, professor of animal reproduction and biotechnology at Colorado State University (CSU), concurred. Timing is of utmost importance when retrieving ovaries. The overall goal is to get the postmortem ovaries to a receiving laboratory that can immediately process them, scraping the follicles and obtaining oocytes.

As a theriogenologist at the CSU Equine Reproduction Laboratory, Dr. Hatzel is involved with the assisted reproductive techniques (ART) program offering intracytoplasmic sperm injection (ICSI) procedures for oocytes col-

lected from postmortem ovaries.

“If viable embryos are produced,” she said, “they are transferred to a recipient mare, using routine transcervical embryo transfer techniques to achieve final pregnancy.”

In addition to timing, many other variables may affect a successful outcome:

- Mare’s age
- Duration and severity of illness
- Previous treatments (how long mare was receiving previous treatments)
- Quality of semen
- Environmental factors
- How the ovaries are handled
- Shipping conditions
- Time of year

The Procedure: What to Expect

The number of oocytes that can be

collected may vary considerably, depending on the number of follicles present on the ovaries. In one study of oocytes collected from mares of various ages and reproductive activity, an average of 11 oocytes was obtained per mare.

“At CSU,” Dr. Hatzel clarified, “we have collected as many as 30 oocytes from shipped ovaries but have also encountered scenarios of collecting no oocytes, primarily from mares with no follicular activity, usually during the winter anestrus period.”

In general, spring transition, late diestrus or early estrus provides the best optimal follicle count (ie, population), thereby yielding the most oocytes during scraping.

Removing ovaries (see Step by Step: How to Remove Ovaries Postmortem) is fairly simple, said Dr. Hatzel, who also offered the follow-

STEP 3 Ideally, locate the ovary that is lying contralateral to the incision first, by palpating over the dorsal uterine surface and following the uterine horn. Complete visualization is rarely possible, so using surgical scissors to complete a blind dissection is recommended.



STEP 4 The ipsilateral ovary is now easy to locate and usually can be visualized through the incision.

STEP 5 After removing both ovaries, rinse them with room temperature embryo flush solution, saline, or lactated Ringer’s solution (LRS) to remove any blood, hair or debris.



STEP 6 Secure the ovaries in fluid-tight plastic bags (double bagging is strongly recommended to avoid leakage during transport), along with a small amount of clean rinse fluid to keep the tissue moist during transport.

Typically, equine practitioners find this technique to be fairly straightforward and easy to perform in a field setting, according to Dr. Jennifer N. Hatzel.





Photo courtesy of Dr. Hatzel

Supplies to have on hand include a small container that is insulated, nonsterile palpation sleeves, a set of nonsterile gloves, lock-tight baggies, and either a saline solution or embryo flush medium. Not shown are a pair of surgical scissors and a scalpel blade. The nonsterile palpable sleeves are worn on the arms, along with an examination glove on each hand. Maintaining surgical sterility is not necessary, but asepsis is advised.

ing additional tips to help guide the first-time practitioner:

- Keep necessary supplies on hand at all times, as removal of the ovaries needs to be done immediately after death of the mare.
- Contact the ICSI facility to alert the team and to obtain contracts for the procedure.
- Never place ovaries on ice. That is one of the worst things that practitioners can do, Dr. Hatzel warned, although she understands why her colleagues might believe that ice would be a good transport medium.
- Avoid rapid temperature fluctuations by carefully packaging

bagged ovaries in a passive cooling device. Ovaries traveling long distances may be exposed to a variety of different environments.

- Surround bagged ovaries with room temperature fluid bags. Bagged saline or lactated Ringer's solution can help maintain a constant temperature and serve as a buffer during transport.
- Arrange for transportation. Contact the ICSI laboratory to discuss the best shipping method. Remember to consider in-transit environmental temperatures and the potential for extreme seasonal variations (eg, excessively hot, humid conditions in the deep south).

- Ovaries traveling two hours or longer should be shipped at room temperature [ie, 15°C–20°C]. If the facility is less than two hours away, the ovaries should be shipped at body temperature (ie, 37°C).

It Takes Two to Tango

In the heat of the moment, practitioners often forget that picking a stallion is the next important step. Frequently, horse owners do not realize that oocytes must be injected with sperm at a very specific time, thereby making stallion selection a potential big hiccup in the short time in which everything needs to happen.

“I always remind veterinarians that owners need to think about a stallion as soon as possible,” Dr. Hatzel emphasized. “We can perform the ICSI procedure using frozen or cooled-shipped semen. For frozen semen, we recommend sending two specimen straws,” adding that although only one straw is needed, having a backup in case something occurs during transport is a good rule of thumb.

Depending on the stallion, shipping a small dose of cooled semen can occasionally offer better results, as not every stallion's semen freezes well, Dr. Hatzel said.

Regardless of whether the semen is shipped frozen or cooled,

Suitable Shipping Containers

- Equitainer (Hamilton Research Inc) (remove coolant cans)
- Equine Express II Semen Shipping Kit (Reproduction Resources)
- EquiSure Cooled Semen Shipper (Plastilite; available exclusively from Breeder's Choice)
- EquiSaver Disposable Shipper (Plastilite; available exclusively from Breeder's Choice)
- Styrofoam box with layers of insulation
- Thermos or Igloo cooler in box
- Micro Q Portable Incubator (Micro Q Technologies)



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the specimen(s) should arrive within 24 hours after the ovaries are received. Ideally, frozen semen would arrive the same day as the ovaries.

One benefit of the ICSI technique is that more than one stallion's semen can be used. But Dr. Hatzel does not advocate using semen from more than two stallions.

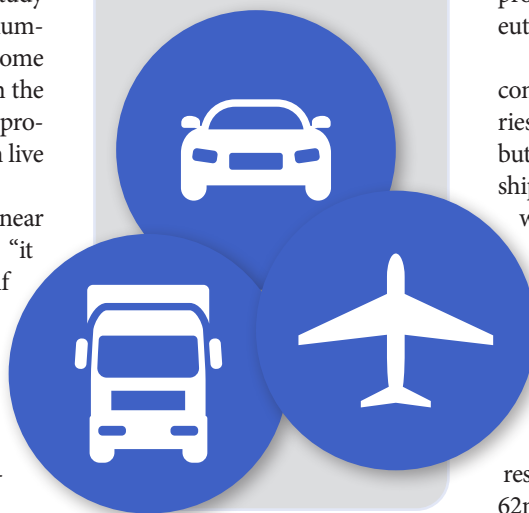
"Because timing is critical," Dr. Hatzel explained, "you really want to be aware of the options available and which facilities near you can handle this type of procedure."

Traditionally, the laboratories at CSU and Texas A&M University have provided most of the clinical ICSI ovary processing and oocyte scraping, in addition to conducting research and publishing study results. But today, a limited number of private practices in some states are beginning to perform the transvaginal aspiration clinical procedure to retrieve oocytes from live standing-sedated mares.

"If one of these facilities is near you," Dr. Hatzel suggested, "it would be beneficial to ask if they are equipped to process postmortem ovaries—that is, scrape a deceased mare's follicles for oocytes to ship to a facility that performs micro-manipulation and sperm injections [ie, ICSI]."

Transport Options

- By car if within driving distance of the ICSI laboratory (eg, CSU or Texas A&M University)
- By next-day service (eg, FedEx, UPS), with arrival 12–14 hours after euthanasia if coordinated to occur as close to the last pickup of the day as possible
- By commercial plane, then by courier service (ie, counter to counter); requires known "designated shipper" status to pass TSA preflight inspection
- By charter company (pricey)



Shutterstock/A-spring

Sending oocytes instead of ovaries to an ICSI lab can hasten the overall process, she added.

The Results

Generally, about half of recovered oocytes mature in vitro and proceed to ICSI. Of that, about 30% to 50% cleave and begin to develop into an embryo, with about half of early embryos continuing to develop into viable embryos for transfer into a recipient mare.

Typically, from euthanasia to in-house transfer of viable embryos takes about 9 to 12 days. If the client wants the embryos vitrified (ie, cryopreserved), that usually happens about 6 to 7 days after the ICSI procedure (ie, about 9–10 days after euthanasia).

Equine practitioners can feel comfortable about removing ovaries from a deceased broodmare, but the logistics of packing and shipping ovaries or oocytes, along with sperm, can at times be intimidating.

"Having a working plan in place prior to the untimely death of broodmares ensures the smoothest process possible, plus gives clients the prospect of realizing a positive end result," Dr. Hatzel said at the AAEP 62nd Annual Convention. **MeV**

For more information:

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4 TIPS

for Bandaging Horse Limbs

B y P a u l B a s i l i o

After sustaining a particularly bad injury to her ankle while falling off her eventing horse, **Marie Rippingale**, BSc (Hons), REVN, G-SQP, DHE CVN, DAVN (Equine) became a bandaging convert.

“In addition to the ice and the ibuprofen, I found that bandaging my ankle with tail bandage material was an effective pain reduction technique,” she said here at the BEVA Congress in Birmingham, England. “My personal experience has shown me that bandaging can be effective when it is done properly. If we can optimize healing in a horse, assist it and support it, then we can get the horse back to doing its job faster, which is what the owners want.”

Ms. Rippingale outlined several bandaging tips to help today’s practitioners gain a more robust insight into the procedure and the potential complications. Some of the tips are based on evidence, and others come from her extensive experience in general practice.

1 START DISTAL AND WORK PROXIMAL

This technique is crucial to push lymphatic fluid and blood to the top of the limb.

“I know a lot of people are starting to question this in small animal practice,” she explained. People may like to go up, cut the material, come back down, and then go up. But as part of a gold standard rule, I think we should [start distal and work proximal]

The Physics of Bandaging

Marie Rippingale, BSc(Hons) REVN, G-SQP, DHECVN, DAVN (equine) noted that much of the information on bandaging described in textbooks is anecdotal evidence or opinion, and little attention is paid to the actual physics behind what a bandage does to a horse’s limb.

“If we look at a bandaged limb, you’ll see direct pressure,” she said. “This direct pressure on the skin causes friction, which is why you’ll have to deal with problems such as sores.”

Looking even deeper, one will find a shearing effect on top of the bone that results from the direct pressure on the soft tissues underneath the skin.

“Sometimes we may forget that this is happening underneath a bandage,” she explained. “We think that a bandage is a bandage—they all look alike. We don’t think about what is going on inside. However, if

a horse is moving around, then the tissues pivot around the bone and create a shearing action that can lead to inflammation, which is where we get problems.

According to Laplace’s law, the smaller the circumference of a cylinder, the higher the pressure that is applied. In other words, you may accidentally apply more pressure to a small animal because the limb is smaller. In horses, less pressure may be applied because the circumference of the limb is larger.

“In addition, the law suggests that the narrower the width of the bandage material, the higher the pressure that is applied,” Ms. Rippingale said. “The more layers of overlap, the higher the pressure applied. This is why we try to do an overlap of 50% each time, because we don’t want to put loads of pressure on the leg.”

until we can prove one way is better than the other.”

2 SELECT THE WIDEST BANDAGE MATERIAL

This is part of Laplace’s Law (see The Physics of Bandaging). Application of a large amount of pressure should be avoided. The goal should be a nice, even pressure, which is why Ms. Rippingale recommended 15-cm bandages instead of the usual 10 cm.

3 OVERLAP BY 50%

This tip also comes from Laplace’s Law.

“If the bandage has a lot of layers, then you’re applying a lot of pressure,” she explained. “You do not want to get to the point where a lot of layers are placed [in one wrap-around] when there are fewer in another. A 50% overlap is all about applying a nice, even pressure up the limb.”

4 DONUTS

Ms. Rippingale recommended using bandages with donut holes instead of slitting the back of the bandage to relieve pressure over bony prominences.

“We found that if you slit the back of the bandage, it doesn’t release pressure over the bony prominence,” she explained. “It increases the pressure in two focal points. It basically moves the pressure to another area.

Ms. Rippingale acknowledged that more research is needed in the field of equine bandaging, but there are ways to increase patient comfort and improve outcomes.

“Employ strict monitoring techniques, use correct bandaging techniques and materials, and watch for complications,” she said. “Even though we don’t have a lot of evidence to suggest where they may be.” **MeV**

Feeding for Performance Affects Stomach Acid

Gastric ulcers are common in today’s performance horses, because of the way they are commonly fed, and the stress of training, showing and traveling. In fact, two out of three competitive horses are affected, according to **Hoyt Cheramie**, DVM, MS, DACVS, senior equine professional Service Veterinarian, at Boehringer Ingelheim, which makes two products approved for equine ulcers.

The average horse’s stomach only has a 2- to 4-gallon capacity because it was designed to digest a small but steady stream of forage throughout the day. As they continuously graze, horses are suppose to produce a large amount of saliva and maintain a mixture of roughage and saliva in their stomach to buffer and help pass acid from the stomach.

However, the feeding styles of today’s performance horses don’t typically follow that schedule. When horses are fed meals, especially concentrates containing cereal grains that are digested more quickly than roughage, the stomach can become empty. But the horse still produces up to 16 gallons of gastric acid each day. Glandular mucosa, a thick mucous layer, robust blood flow and naturally produced sodium bicarbonate, protects the lower portion of the stomach from the acid. The upper part of the stomach, lined by squamous mucosa, doesn’t offer the same protection from the acid and ulcers occur if stomach acids accumulate.

Make feeding recommendations to help owners and trainers keep acid levels under control. “The most natural way to feed a horse is to provide grazing for most of the day. However, that isn’t feasible for most performance horses that are fed large infrequent meals, have limited turnout and grazing, and are under the stress of training, showing and traveling; yet their stomachs still produce all of that gastric fluid on relatively empty stomachs,” Dr. Cheramie said.

Whenever possible, allow the horse to take advantage of a quality roughage based diet, and Dr. Cheramie suggested increasing grazing time; using a slow-feed or grazing hay net; replacing calories from cereal grains with good quality roughage; and adding alfalfa to the diet where appropriate.

If that is not possible, consider omeprazole (Ulcergard and Gastrogard), which inhibits acid production at the source – the proton pumps in the glandular mucosa. They have patented formulations that protects the omeprazole from being broken down by acid. **MeV**

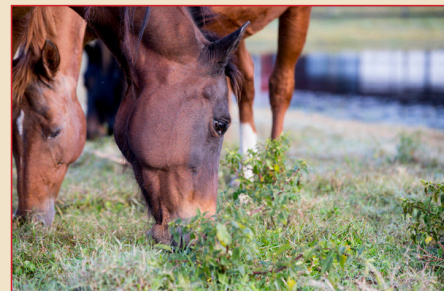


Photo courtesy of Boehringer Ingelheim

RVT Develops State-of-the-Art Large Animal CT Table



Photo courtesy of UC Davis

Performing a CT scan on a horse is a laborious process, involving forklifts and cranes, which takes a team of nearly a dozen technicians and veterinarians. Thanks to an innovative University of California at Davis imaging technician, **Jason Peters**, RVT, RLAT, however, that process just got a lot less complicated.

Mr. Peters worked with UC Davis Engineers and Finishline Advance Composites to design a carbon fiber table that weighs only 100 lbs, but can handle up to 10,000 lbs in any given area. The carbon fiber can handle off-

balanced loads and certain impacts to the table while loading and unloading the patient. Older CT tables weigh twice as much and are not nearly as strong.

The old table was stationary. If a horse needed both front and hind legs scanned, the horse would need to be physically repositioned by the technicians. Keeping this in mind, Mr. Peters incorporated slide actuators under the table that enable it to move side-to-side and to-and-from the CT machine. Now, the horse can remain stationary, and the table can be easily moved into position.

The new table also decreases the time it used to take to switch from small animal to large animal. **MeV**

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2D
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Identifying and Diagnosing

Bacterial Pleuropneumonia

While a cough and discharge are often associated with respiratory disease, the presence or absence of these signs might not be of much diagnostic help in the field.

"Cough is certainly not a consistent component," said **Rodney L Belgrave**, DVM, DACVIM, of the Mid-Atlantic Equine Medical Center in Ringoes, NJ. "We see horses with severe, advanced respiratory disease, and the owner states that the horse never coughed. That doesn't rule out the presence of disease."

The same applies for discharge. Discharge originating in the lower respiratory tract may simply be swallowed.

For horses with bacterial pleuropneumonia, disease is characterized by the presence of inflammation of the visceral and parietal pleural membranes, with subsequent transudate production and sequestration of fluid into the thoracic cavity.

While pleural effusion can be caused by fungal pneumonia, hemothorax, neoplasia and other conditions, most cases occur secondary to bacterial pneumonia. However, determining the presence of effusion in the lower respiratory tract or identifying when pleural drainage is indicated can sometimes be difficult for practitioners.

"It certainly seems to be most prevalent among racehorses due to the close commingling of horses of various ages that may have upper respiratory viral infections that run rampant through race-tracks," Dr. Belgrave said. "However, any horse that is subjected to long transport times during which they are not able to lower their head to clear their airways is at risk of pneumonia."

Viral infection of the upper respiratory tract is a major predisposing cause of bacterial pneumonia. It can lead to viral induced suppression of the horse's defense mechanism against pulmonary bacteria. It

B y P a u l B a s i l i o

can also impair phagocytic activity, which ultimately leads to compromise of the mucociliary clearance of the lower respiratory tract.

The most common aerobic bacterial isolate in bacterial pleuropneumonia is *Streptococcus equi* subsp *zooepidemicus*. Gram negative organisms, such as *Klebsiella pneumoniae*, *Escherichia coli*, *Actinobacillus* spp and *Enterobacter* spp are also identified as culprits in some cases.

Clinical signs vary according to the stage of disease and the degree of effusion, but most horses with acute disease have fever, anorexia and lethargy.

"They may exhibit cough, nasal discharge and exercise intolerance," Dr. Belgrave added. "There will certainly be some degree of respiratory effort, depending on the quantity of the effusion in the thoracic cavity. Horses with pleural pain will exhibit a reluctance to move, and will often stand with the elbows abducted to try to relieve pressure from the thoracic wall."

Obtaining a good history is paramount when assessing these horses.

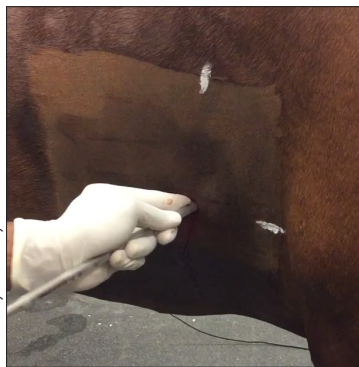


Photo courtesy of Dr. Rodney

Performing a thoracocentesis.

es. In addition, thoracic auscultation with a rebreathing bag from the craniodorsal lung field down to the ventral lung field is crucial. This is where diminished lung sounds will likely be heard, since this is the area of the thorax where pleural fluid is likely to accumulate.

"In the acute stages of disease, you can hear pleural friction rubs," he said. "Endoscopic examination of these horses is critical in the initial assessment. You want to see if there have been any surgeries performed on the upper respiratory tract that would predispose the horse to aspiration pneumonia, and

you also want to quantify and qualify the exudate prior to performing a transtracheal wash."

Bloodwork will typically show leukopenia in the acute stages. Most horses also have hyperfibrinogenemia and elevated serum amyloid A. Chronic cases may involve leukocytosis, anemia of chronic inflammation, and a low albumin to globulin ratio.

"Thoracic ultrasound is an integral part of both the diagnosis and management of these patients," Dr. Belgrave explained. "It allows you to assess the quantity and character of the pleural fluid so you can determine whether you need thoracic drainage. You can also quantify the amount of fibrin and the presence of adhesions."

MeV

Watch Dr. Belgrave perform a thoracocentesis to remove fluid from the pleural space.

Watch an ultrasound of the lung shows pleuropneumonia.

Treating Equine Respiratory Disease

Broad-spectrum IV antibiotic therapy should be considered for bacterial pneumonia pending culture and susceptibility results, according to Rodney L Belgrave, DVM, DACVIM, of the Mid-Atlantic Equine Medical Center in Ringoes, NJ.

Dr. Belgrave typically prefers to start with penicillin with an aminoglycoside or fluoroquinolone. Metronidazole can be added if *Bacteroides fragilis* is present, as penicillin is ineffective against this pathogen.

He often transitions horses off of the IV antibiotic regimen and on to chloramphenicol for long-term treatment, but this is often not convenient in the field.

"It's typically administered four times daily, but I do know practitioners who use it three times daily and they have success with it," he said.

He also uses nebulization with some antimicrobials. Ceftiofur at a dose of 2.2 mg/kg once daily is often employed due to its usefulness against *S zooepidemicus*.

For pleural drainage, placement of the chest tube in the most ventral aspect of the thorax is beneficial.

"First, use ultrasonography to locate the ideal pocket of fluid," Dr. Belgrave said. "Go as close to the diaphragm as possible. Once you locate

and mark your spots, go on the cranial border of the rib to avoid the nerves and vessels that run on the caudal border. Block all the way down to the parietal pleura, and then pop into the chest. Always slide the chest tube off of the trocar into the chest cavity, as opposed to pulling out the trocar."

After the chest tube is in place, pleural lavage with sterile fluids can be beneficial to remove fibrin and the pro-inflammatory cytokines present in the pleural fluid. Dr. Belgrave typically performs the lavage daily for the first three to four days.

Concurrent administration of IV fluids may be warranted if draining a large quantity of pleural fluid.

"Bronchial lavage can also be helpful in removing some of the exudate from the small airways," he said. "If I have been treating a horse and it still has quite a bit of exudate in the lower respiratory tract, I will use an endoscope to find the most significantly affected airway. I'll infuse lidocaine into the airway, then lavage saline into the airway, distend it, pull the fluid into a syringe, and repeat as needed."

Prognosis depends on early and aggressive intervention. Many horses with this disease can return to their previous level of activity if the disease is recognized early and treated appropriately in the acute stage

A Difficult Arrival



Ryan Corrigan, RVT, LVT

On Feb. 13, 2015 at 11:00 am, an Appendix Quarter Horse mare that was approximately 320 days in foal was admitted to Woodside Equine Clinic for foaling out services. The 11-year-old mare, weighing approximately 560 kg, had been considered an at-risk mare because she had undergone a twin reduction procedure earlier in her pregnancy and she was a maiden mare.

Upon arrival to Woodside, a pre-foaling exam was performed which showed a slight tachycardia of 52 beats per minute, a respiratory rate of 16 breaths per minute and a rectal temperature of 100° F. She had minimal udder development and no Caslicks procedure had been performed. A transrectal ultrasound was performed that showed two fetal limbs visible and that the foal was in a dorsopubic position. The mare was taken to the mare barn where she was fed 3 lbs of Triple Crown growth in the morning, 4 lbs Triple Crown growth in the evening and turned out in a grass

paddock to graze during the day.

On March 4, 2015 it was noticed at 6:38 am that the mare had developed wax on both teats indicative that the mare was getting ready to foal. Over the next nine days the mare was restless, circling her stall frequently, flicking her tail and flank watched intermittently.

The mare went into Stage 1 labor late in the afternoon of March 12th showing increased time laying in both sternal and lateral recumbency and flank watching. At 6:55 pm on March 12, 2015 the Foal Alert monitoring system alerted the attending intern that the mare's amniotic membrane had ruptured and she was having active contractions (signs of Stage 2).

A hoof was the first body part presenting followed closely by the second hoof and the muzzle—the foal was in proper anterior longitudinal position for delivery. The filly was delivered without assistance at 7:11 pm. The filly appeared dysmature at birth as she was quite small, approximately 25 kg, with poor muscling over her hindquarters and flank. A quick physical exam was performed on the foal which revealed a heart rate of 144 bpm, a respiratory rate of 16 breaths per minute and a rectal

**The maiden mare
had undergone
a twin-reduction
procedure earlier
in her pregnancy.**



Photos courtesy of Shana Lemmenes

The filly appeared dysmature at birth as she was quite small.



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temperature of 98.2° F—all within normal limits. The placenta was passed at 7:55 pm and—upon inspection—the fecal membranes weighed 4.1 kg and were completely intact but subjectively thin. The filly was unable to stand on her own and was assisted to stand at 9:00 pm. She showed a strong suckle reflex but was unable to find a teat to nurse on her own.

The mare's udder was cleaned with some warm water and rolled cotton and a small sample of colostrum was obtained for evaluation. The colostrum appeared

gorged. Her physical exam was within normal limits with a heart rate of 36 bpm, a respiratory rate of 12 beats per minute, and a temperature of 99.8° F. Auscultation of her GI tract was within normal limits.

A detailed foal exam was then performed which showed a heart rate of 140 bpm, a respiratory rate of 16 breaths per minute, a rectal temperature of 98.2° F, and abnormal limb conformation on the filly. In addition to her poor hind-end muscling, she had a windswept appearance on the left, was slightly back at the knee, had mild fetlock laxity and pelvic asymmetry with the left side lower and the left hind deviating medially. At 12 hours of age the nursing team obtained blood from the filly to perform a packed cell volume (PCV), total solids, fibrinogen, complete blood count (CBC) and an immunoglobulin G SNAP test.

The results showed a PCV of 38%, a hypoproteinemia of 4.4 g/dL, and a fibrinogen of 0 mg/dL. The CBC was unremarkable with a white blood cell count of $9.72 \times 10^9/L$. The immunoglobulin G test was greater than 800 mg/dL indicating that there was no failure of passive transfer and the foal had received enough antibodies from the donor mare and the dam. Throughout the day the foal did well but required assistance to stand. Once standing, she was able to ambulate well and nurse unassisted with an excellent appetite. The plan for the filly was to continue to assist her to stand every hour and monitor her nursing. Her umbilicus was being dipped in chlorohexadine solution every 6 hours, and she was receiving a light bath once a day to clean her hind quarters.

The filly became colicky again while nursing around 7:30 am on the morning of March 14, 2015. Her heart rate was 160 beats per minute, she had gastrointestinal sounds present in all four quadrants, and a digital rectal exam revealed a firm fecal ball in the rectum. A 60 mL soapy enema was administered which resulted in the passage of a couple hard fecal balls and a large amount of soft milk manure. She was administered IV flunixin meglumine and sucralfate orally. Her hind limbs became stronger as the day progressed and she was seen spending more time standing and walking in the stall. At 7:00 pm she was able to stand successfully on her own for the first time. Unfortunately, as the night progressed the filly seemed to deteriorate as her gait had become stiff, she was having more difficulty standing, and she began toe dragging both hind limbs.

At 1:00 am on March 15, 2014 her gait worsened, both hocks felt warm to the touch, and she was pyrexemic with a rectal temperature of 103.2°F. Range of motion tests were performed on both hind limbs that

The advanced skills required by an equine technician in this situation includes primary neonatal care, such as dipping the umbilicus, assisting the filly to stand and teaching her to nurse.

milky white and had a low specific gravity of 1.050 g/dL. Due to the poor colostrum quality and her inability to stand, the filly was intubated with a nasogastric tube and 118 mL of donor colostrum was administered. The foal's umbilicus was dipped in dilute chlorohexadine solution to prevent infection, which could lead to septicemia and a Fleet enema was administered which resulted in the passage of meconium.

Overnight the filly was assisted to stand every hour and at 11:00 pm and 1:00 am a nasogastric tube was passed and 236 mL of her dam's milk was administered. When she was assisted to stand at 2:00 am on March 13, 2015 the filly was able to nurse on her own for 2 minutes. However, around 4:00 am—just after nursing—she became colicky and was seen lying down and rolling. Her heart rate at this time was between 150–160 bpm and her gastrointestinal motility was normal. Shortly thereafter the filly passed 5 small piles of manure and a large amount of gas. She was administered IV flunixin meglumine and became comfortable within 5 minutes.

On the morning of March 13, 2015 a post-parturition exam was performed on the mare by Woodside's theriogenologist that revealed a heart rate of 40 bpm, a respiratory rate of 12 breaths per minute, a temperature of 100.0° F, and no significant tearing of her vulva, perineum or anus was noted. There was a moderate hematoma present on the left side of her vulva. Her udder was large and her teats were en-

Teaching Points

This case had multiple facets of nursing care, including both assisting in parturition and immediate neonatal care. I was not present when this mare delivered but instead arrived first thing in the morning and was tasked with obtaining blood and performing lab work. With the aid of the reproduction center assistant who restrained for me, I obtained 6 mL of blood from the right jugular vein which I took to the lab to run the tests. The most important lab test on neonates is the immunoglobulin G test because this will direct the rest of the care of the foal. Since foals are born immunocompromised, they need to receive antibodies to fight disease from their mother's colostrum, a donor's colostrum, or in the worst case scenario—from a plasma transfer. My role for the remainder of the day was to assist the foal to stand every 30 minutes to 1 hour and monitor her overall progress. It is important that foals are lifted correctly using the chest and tail for support. Lifting from the abdomen can rupture the bladder and cause septicemia. To help the foal gain strength I tried to give the minimal amount of assistance needed. I helped lead the foal to the udder, and using my finger as a guide, tried to teach the foal to nurse off the teat. This filly had a good suckle reflex so the primary issue was helping her find the teat—not keeping her latched on. I kept a close eye on her while she nursed to make sure she was not aspirating any milk. The umbilicus is one route infection can find its way into the foal's body and cause septicemia. To prevent this I dipped the foal's umbilicus in chlorohexadine solution every six hours.

The advanced skills that I performed included primary neonatal care such as dipping the umbilicus, performing an enema, assisting the filly to stand and teaching her to nurse. I performed the requested lab work, performed physical exams on both the mare and foal, obtained blood from the foal, and milked the mare out as needed. I assisted with nasogastric intubation of the foal and the post-parturition exam on the mare.

Neonatal care is one of my biggest passions in veterinary medicine and I find cases like this very rewarding. Our hospital is not staffed well enough to accommodate extremely critical or maladjusted foals that require 24-hour care and we had to refer the foal as it became apparent that she was going to need more intensive care. This case left me feeling as though I wish I could have done more, but referring the mare and foal to a university that is better equipped to treat them was the right decision.



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resulted in no pain elicited and no decrease in range of motion. There was also moderate distal limb edema in all four limbs.

Blood was obtained from the filly and a CBC, PCV, total solids, and fibrinogen were repeated. The results showed an overall downward trend on all tests—the packed cell volume was 35%, the hypoproteinemia had dropped to 4.1g/dl, and the fibrinogen had increased to 400 mg/dl—indicating an increase in inflammation. A moderate leukopenia was seen on the complete blood count at $4.36 \times 10^9/L$. Around 4:00 am, three days after the foal was born, the mare and foal were loaded onto a trailer to be referred down to the Marion DuPont Scott Equine Medical Center at the Virginia-Maryland Regional College of Veterinary Medicine for further treatment.

Ultimately, the foal was euthanized at Marion DuPont Scott after developing diarrhea and hypoglycemia. She also was found to have only 30% ossification in her tarsal bones, which was contributing to her inability to stand well on her own. She was given a poor prognosis for surviving to maturity and the owners elected to humanely euthanize.

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About the author

Ryan is a Licensed Veterinary Technician that was with Woodside Equine Clinic outside of Richmond, Virginia since March 2014 up until January of 2017. Her educational background includes a Bachelor of Sciences in Veterinary Technology from Purdue University (2010) and in 2015 she passed her Veterinary Technician Specialty (VTS) boards for the Academy of Equine Veterinary Nurses. She interned at Littleton Large Animal Clinic in Denver, CO and after graduation she worked as a medicine technician at Hagyard Equine Medical Institute in Lexington, KY. From there she followed her passion for horse racing and neonatal care to Australia where she worked for Coolmore, one of the biggest thoroughbred racing farms in the world, for their Australian division as a veterinary nurse. Before moving to Virginia she lived and worked in San Diego, CA with a sports medicine practice. At Woodside Ryan was responsible for ICU patient care, anesthesia for the surgeries, and daily outpatient appointments. When she's not caring for her patients she trains and races triathlons, snowboards, and plays with her Rottweiler puppy Denali.

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