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Super Stud

Using Ultrasonography
in the Breeding Exam

Ventilator Mix Improves Surgical Outcomes

Gene Therapy for Lameness

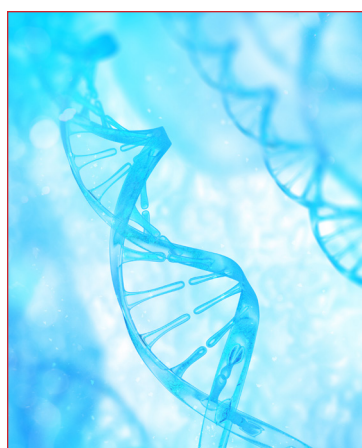
Leptospira May Cause EUR

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Sexual Chimerism in Spanish Horses Not Linked to Infertility

The prevalence of twin births and chimerism in a large population of Spanish horses suggest that chimerism may not be connected to infertility.

Chromosomal anomalies are one of the principle genetic causes of infertility in horses. However, a great proportion of these cases still go undiagnosed, probably due to the fact the signs are nonspecific and the diagnosis is complex. This is the case with chimerism, which is greatly associated with twin births in domestic animals, but the prevalence and reproductive effects are still unknown in horses.

Chimerism is a genetic disorder in which 2 zygotes combine after fertilization to form 1 single zygote that develops normally. The resulting in a being with 2 types of different cells, each with a different genetic constitution. In most documented cases, the cells of different organs or different parts of the body have different DNA, as if 2 beings were present in 1 body.

Chimerism is a genetic disorder where 2 zygotes combine after fertilization to form 1 single zygote.

In general, this disease is produced either by the exchange of hematopoietic stem cells via placental circulation between dizygotic twins (blood chimerism) or by the fusion of 2 embryos in the first stages of development (true chimerism).

Researchers from the University of Seville analyzed foaling data from more than 21,000 purebred Spanish horses born in 2015 and 2016. They used a novel and validated molecular test based on short tandem repeat markers to detect chimerism. They found 14 twin births that resulted in 23 live twins and 5 cases of blood chimerism.

MeV

For more information:

Anaya G, Fernández ME, Valera M, et al. Prevalence of twin foaling and blood chimerism in purebred Spanish horses. *Vet J.* 2018;234:142-144. <https://www.sciencedirect.com/science/article/pii/S1090023318300480?via%3Dihub>



New study says chimerism may not be connected to infertility.

Credit: ANCC

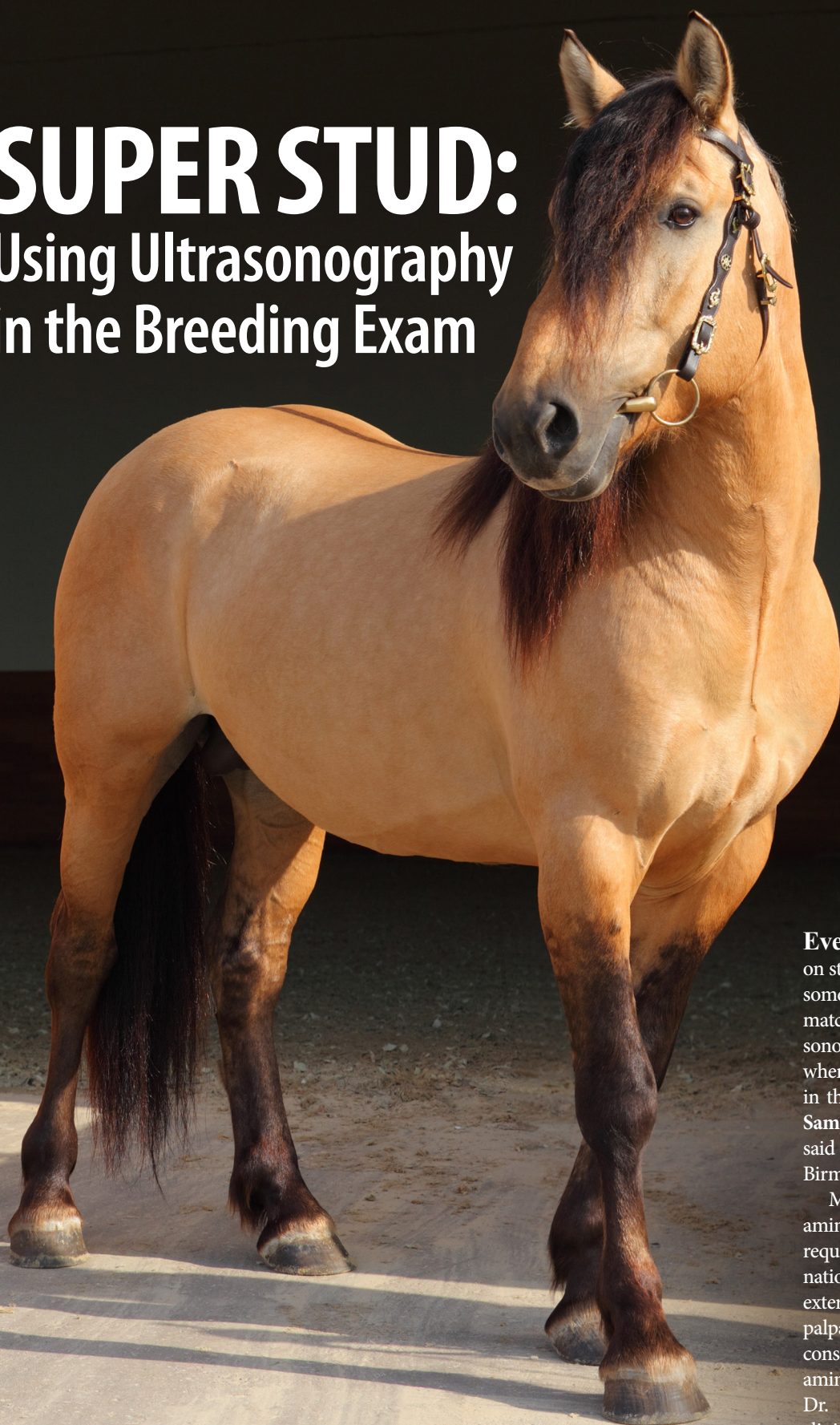
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SUPER STUD:

Using Ultrasonography in the Breeding Exam



Every owner with a champion stallion wants a super stud, but sometimes the equipment doesn't match the expectations. Ultrasonography can be a useful tool when abnormalities are suspected in the reproductive stallion, **Juan Samper, DVM, MSc, PhD, DACT**, said at the 2018 BEVA Congress in Birmingham, U.K.

Most breeding soundness examinations are straightforward, requiring a basic physical examination and an evaluation of the external genitalia, which includes palpation of the scrotum, testicular consistency and position, and examination of the penis, explained Dr. Samper, associate dean and clinical professor of Theriogenol-

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ogy, College of Veterinary Medicine at the University of Florida. He also advised looking at the stallion from a distance to see issues that are not related to the reproductive tract but could affect the reproductive performance of the horse or his offspring, such as leg confirmation.

Later, veterinarians will collect semen from the stallion and look at sperm numbers, the total number of sperm in the ejaculate, the motility, morphology, etc.

“By performing these routine procedures, we are able to ascertain with a high degree of confidence the stallion’s suitability for breeding and its ability to impregnate mares at a reasonable rate,” he said. “Most of the time, we don’t have a problem. They are fine. There are other times that we will feel those testes and there is a little something here that does not look right or maybe

“When there is something that doesn't add up, when the puzzle doesn't come together, it is important to take that extra step.”

—Dr. Juan Samper

we look at the semen and say, ‘Huh?’ There may be some white cells in this collection or a little bit of urine—something that is not normal. That is when we need to

look at other ways to examine that horse,” Dr. Samper said.

“When there is something that doesn’t add up, when the puzzle doesn’t come together, it is important to take an extra step,” he said.

Sometimes abnormalities are detected that require the use of either more sophisticated or different image modalities, such as microscopy, laparoscopy, endoscopy or ultrasonography.

Ultrasonography Common

“Certainly, ultrasonography is one of the more common things that we use as an ancillary test when we are looking at stallions,” he said.

He tends to use a portable ultrasound with a linear 7.5–10 MHz probe. Depending on the examination, sedation with butorphanol and detomidine might be needed.

“If we are going to do a rectal



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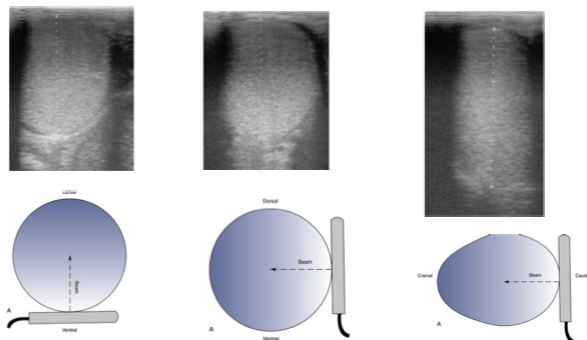
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Testicular size/Volume Calipers or US

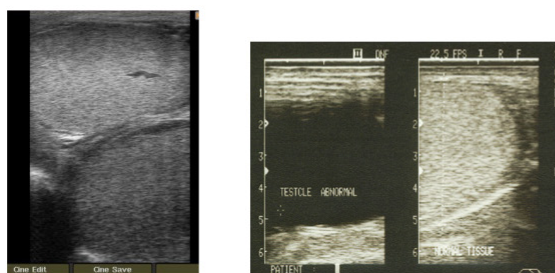


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The Scrotum and contents

- Smooth and free from evidence of trauma, inflammation or dermatological lesions, and obvious median raphe.



examination, we don't need to sedate the horse," he said. "They tolerate that procedure very well. But if we are going to do a testicular ultrasound or measure testicular volume—things like that—then it is recommended to sedate the horse because they then relax the testes, and we are able to have better access to them."

Abnormalities of the scrotum are normally limited to the skin. The scrotum should be smooth and free from evidence of skin disease or dermatological problems, trauma, inflammation and

A transabdominal or transrectal ultrasonographic examination may require sedation.

an obvious median raphe. "We should be able to observe a median raphe in the testes so we can be very clear that we have somewhat

evenly sized testicles," he said.

When the scrotum is rounded or pendulous, consider haemotocoeles, varicocoeles that often result in hydrocoeles. Look and see if the enlargement is unilateral or bilateral.

When looking at the testicle, veterinarians should see a homogenous image, although the central vein might be more prominent in some horses. If something else is seen, then that needs more explanation, he said. Dr. Samper discussed one prepurchase examination he did where the scrotum was normal but the testicle was missing the epididymis. When he started to question the finding, he ultrasounded the area and found that the horse had a silicone implant because he had an undescended testicle.

A transabdominal or transrectal ultrasonographic examination may require sedation, he said. In instances where a testicle is not descended, it could help determine the position and side of the retained testicle, and could guide the selection of the best surgical approach for removal.

Locating the Testicle

Identification and location of the testicle is fairly easy: Identify the ampullae rectally and start following the vas deferens toward the inguinal ring of the compromised side.

"Most of the time we will have to sedate the horse heavily to give a good relaxation of the muscles. If the retained testicle is in the inguinal canal, it will be easy to identify," he said.

Using ultrasonography is the most accurate and repeatable way to measure testicular volume. "The one thing we do routinely with stallions is measure the size of the testicles. What we want to measure is testicular volume," he said. Take 3 measurements: height and width of the testicle. Don't put too much pressure on the scrotum so



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There is a relationship between testicular volume and sperm numbers, but a stallion reaches his capacity at around 5 years.

it doesn't flatten. "Make sure that every measurement taken has a rounded area right where the probe is," he suggested.

There is a relationship between testicular volume and sperm numbers, but a stallion reaches his maximum capacity to produce sperm at

around 5 years of age, and there is some variance between the winter and summer.

To understand what the testicular volume means, veterinarians must correlate the calculated number to the numbers in the ejaculate, he explained.

For instance, low sperm counts with large testicular size suggests uni- or bilateral partially blocked ampullae, where higher sperm numbers than predicted by the testicular volume suggest sperm accumulation. "That stallion had a lot of older sperm that accumulated he had to get rid of, and you need to collect more than once a day, or over several days, to get new sperm," he said.

Improving the Quality of Frozen Sperm

The formation of ice that occurs during cryopreservation can affect sperm structure and quality.

Permeable cryoprotectants, which are substances that penetrate tissues and act inside cells to stop ice crystals from forming in low temperatures, are added to diminish this affect.

Although these substances improve the process, they damage the sperm membrane when they enter the cell, causing permanent harm that affects fertility. Facing this issue, the Veterinary Reproduction research group from the University of Cordoba Animal Medicine and Surgery Department developed an alternative that improves the quality of spermatozoa when they are frozen. The research group opted to use a different, less invasive kind of cryoprotectants.

These impermeable cryoprotectants protect the spermatozoon but act on the external part of the cell, instead of inside the cell. Specifically, the researchers used protectants made up of bovine serum albumin (BSA)—an antioxidant protein—and sucrose, a sugar that increases viscosity and dehydrates the cell, which in turn decreases ice formation that happens in the freezing process.

"Once we determined the appropriate concentration of this cryoprotectant that had to be used, we observed that the results were similar or even better than when using glycerol, the traditional permeable cryoprotectant," explained **César Consuegra**, a PhD student at the university.

In addition, the research group has determined that this new method better protects the acrosome, a small deposit located at the tip of the spermatozoon that contains certain enzymes.

The group plans to try to use liquid nitrogen—where the drop in temperature is much faster compared with other conventional methods. In this way, even less harm would be done to the sperm, they said.

For more information:

Consuegra C, Crespo F, Bottrel M. Stallion sperm freezing with sucrose extenders: A strategy to avoid permeable cryoprotectants. *Anim Reprod Sci.* 2018; 191: 85-98.

<https://www.sciencedirect.com/science/article/pii/S0378432018300265?via%3Dihub>

Testicular irregularities

Testicular irregularities that are seen with the ultrasound are asymmetry, as well as testicles that are softer or harder because of degenerative conditions, neoplasia or trauma.

Ultrasonography is also useful for checking the bulbourethral glands, and the 2 lobes of the prostate.

In addition, ultrasonography is useful for examining the vesicular glands that are not always evident, although they can be seen if the stallion has been sexually stimulated for a while or has an inflammatory or infectious condition. "The most interesting part of this is to identify the ampulla, to see if there is fluid and the nature of that fluid," he said.

Although ultrasonography of the penis is infrequent unless there is a problem, it can help determine fibromas, underlying causes for erectile dysfunction and conditions related to trauma.

Ultrasonography is also useful for examining the pelvic urethra looking for cysts and uroliths.

While most stallion examinations are routine, ultrasonography is a useful tool for determining the underlying cause of any problems that keep that stallion from being a super stud.

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Indications

For treatment and prevention of recurrence of gastric ulcers in horses and foals 4 weeks of age and older.

Dosage Regimen

For treatment of gastric ulcers, *GastroGard* Paste should be administered orally once-a-day for 4 weeks at the recommended dosage of 1.8 mg omeprazole/lb body weight (4 mg/kg). For the prevention of recurrence of gastric ulcers, continue treatment for at least an additional 4 weeks by administering *GastroGard* Paste at the recommended daily maintenance dose of 0.9 mg/lb (2 mg/kg).

Directions For Use

- *GastroGard* Paste for horses is recommended for use in horses and foals 4 weeks of age and older. The contents of one syringe will dose a 1250 lb (568 kg) horse at the rate of 1.8 mg omeprazole/lb body weight (4 mg/kg). For treatment of gastric ulcers, each weight marking on the syringe plunger will deliver sufficient omeprazole to treat 250 lb (114 kg) body weight. For prevention of recurrence of gastric ulcers, each weight marking will deliver sufficient omeprazole to dose 500 lb (227 kg) body weight.
- To deliver *GastroGard* Paste at the treatment dose rate of 1.8 mg omeprazole/lb body weight (4 mg/kg), set the syringe plunger to the appropriate weight marking according to the horse's weight in pounds.
- To deliver *GastroGard* Paste at the dose rate of 0.9 mg/lb (2 mg/kg) to prevent recurrence of ulcers, set the syringe plunger to the weight marking corresponding to half of the horse's weight in pounds.
- To set the syringe plunger, unlock the knurled ring by rotating it 1/4 turn. Slide the knurled ring along the plunger shaft so that the side nearest the barrel is at the appropriate notch. Rotate the plunger ring 1/4 turn to lock it in place and ensure it is locked. Make sure the horse's mouth contains no feed. Remove the cover from the tip of the syringe, and insert the syringe into the horse's mouth at the interdental space. Depress the plunger until stopped by the knurled ring. The dose should be deposited on the back of the tongue or deep into the cheek pouch. Care should be taken to ensure that the horse consumes the complete dose. Treated animals should be observed briefly after administration to ensure that part of the dose is not lost or rejected. If any of the dose is lost, redosing is recommended.
- If, after dosing, the syringe is not completely empty, it may be reused on following days until emptied. Replace the cap after each use.

Warning

Do not use in horses intended for human consumption. Keep this and all drugs out of the reach of children. In case of ingestion, contact a physician. Physicians may contact a poison control center for advice concerning accidental ingestion.

Adverse Reactions

In efficacy trials, when the drug was administered at 1.8 mg omeprazole/lb (4 mg/kg) body weight daily for 28 days and 0.9 mg omeprazole/lb (2 mg/kg) body weight daily for 30 additional days, no adverse reactions were observed.

Precautions

The safety of *GastroGard* Paste has not been determined in pregnant or lactating mares.

Efficacy

- **Dose Confirmation:** *GastroGard*® (omeprazole) Paste, administered to provide omeprazole at 1.8 mg/lb (4 mg/kg) daily for 28 days, effectively healed or reduced the severity of gastric ulcers in 92% of omeprazole-treated horses. In comparison, 32% of controls exhibited healed or less severe ulcers. Horses enrolled in this study were healthy animals confirmed to have gastric ulcers by gastroscopy. Subsequent daily administration of *GastroGard* Paste to provide omeprazole at 0.9 mg/lb (2 mg/kg) for 30 days prevented recurrence of gastric ulcers in 84% of treated horses, whereas ulcers recurred or became more severe in horses removed from omeprazole treatment.
- **Clinical Field Trials:** *GastroGard* Paste administered at 1.8 mg/lb (4 mg/kg) daily for 28 days healed or reduced the severity of gastric ulcers in 99% of omeprazole-treated horses. In comparison, 32.4% of control horses had healed ulcers or ulcers which were reduced in severity. These trials included horses of various breeds and under different management conditions, and included horses in race or show training, pleasure horses, and foals as young as one month. Horses enrolled in the efficacy trials were healthy animals confirmed to have gastric ulcers by gastroscopy. In these field trials, horses readily accepted *GastroGard* Paste. There were no drug related adverse reactions. In the clinical trials, *GastroGard* Paste was used concomitantly with other therapies, which included: anthelmintics, antibiotics, non-steroidal and steroidal anti-inflammatory agents, diuretics, tranquilizers and vaccines.
- **Diagnostic and Management Considerations:** The following clinical signs may be associated with gastric ulceration in adult horses: inappetence or decreased appetite, recurrent colic, intermittent loose stools or chronic diarrhea, poor hair coat, poor body condition, or poor performance. Clinical signs in foals may include: bruxism (grinding of teeth), excessive salivation, colic, cranial abdominal tenderness, anorexia, diarrhea, sternal recumbency or weakness. A more accurate diagnosis of gastric ulceration in horses and foals may be made if ulcers are visualized directly by endoscopic examination of the gastric mucosa. Gastric ulcers may recur in horses if therapy to prevent recurrence is not administered after the initial treatment is completed. Use *GastroGard* Paste at 0.9 mg omeprazole/lb body weight (2 mg/kg) for control of gastric ulcers following treatment. The safety of administration of *GastroGard* Paste for longer than 91 days has not been determined. Maximal acid suppression occurs after three to five days of treatment with omeprazole.

Safety

- *GastroGard* Paste was well tolerated in the following controlled efficacy and safety studies.
- In field trials involving 139 horses, including foals as young as one month of age, no adverse reactions attributable to omeprazole treatment were noted.
- In a placebo controlled adult horse safety study, horses received 20 mg/kg/day omeprazole (5x the recommended dose) for 90 days. No treatment related adverse effects were observed.
- In a placebo controlled tolerance study, adult horses were treated with *GastroGard* Paste at a dosage of 40 mg/kg/day (10x the recommended dose) for 21 days. No treatment related adverse effects were observed.
- A placebo controlled foal safety study evaluated the safety of omeprazole at doses of 4, 12 or 20 mg/kg (1, 3 or 5x) once daily for 91 days. Foals ranged in age from 66 to 110 days at study initiation. Gamma glutamyltransferase (GGT) levels were significantly elevated in horses treated at exaggerated doses of 20 mg/kg (5x the recommended dose). Mean stomach to body weight ratio was higher for foals in the 3x and 5x groups than for controls; however, no abnormalities of the stomach were evident on histological examination.

Reproductive Safety

In a male reproductive safety study, 10 stallions received *GastroGard* Paste at 12 mg/kg/day (3x the recommended dose) for 70 days. No treatment related adverse effects on semen quality or breeding behavior were observed. A safety study in breeding mares has not been conducted.

For More Information

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SURGERY



Ventilating with a Mixture of Helium and Oxygen IMPROVES SURGICAL OUTCOMES

By Katherine Unger Baillie

For the best access during general surgery, horses may be placed on their sides or even their backs, a position that puts considerable pressure on their internal organs, often leading to partial lung collapse. In spite of using oxygen-rich ventilation, blood oxygen levels can fall to dangerous levels during lengthy procedures.

Researchers at the University of Pennsylvania wanted to get more clarity on the best approach for ventilating horses. A study led by **Klaus Hopster, DVM, DrMedVet, DECVA**, an assistant professor of large animal anesthesiology at Penn's School of Veterinary Medicine's New Bolton Center, found that horses re-

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ceiving heliox—a combination of helium and oxygen—while under anesthesia did better than those receiving pure oxygen. Adjusting the pressure of the ventilation the horses received also improved overall oxygenation, the study found.

“Our paper showed that when you use high pressure ventilation using heliox, you’re able to achieve better results,” Dr. Hopster said. “The results are clear in healthy horses; what we’d like to do in the near future is see if we can extend this to other species or compromised animals.”

The new research shows the benefits of ventilating horses undergoing surgery with a mixture of helium and oxygen.

Colic surgery is a common reason that horses may be put under general anesthesia in a dorsal position, to easily access the abdomen. In this position, using gas under higher pressure to ventilate a patient can succeed in getting oxygen to the lungs’ alveoli, and overcome the heavy weight that makes lungs prone to collapse. But high pres-

ures also put stress on the heart and blood vessels that can damage these organs.

In colic procedures, which can be lengthy, prior research by Dr. Hopster and colleagues has shown that ensuring sufficient respiratory function while a patient is under anesthesia improves outcomes afterward, likely because the volatile anesthetic drugs must be exhaled.

“The ultimate goal is to use the best pressure for gas exchange and oxygenation and the lowest pressure possible, because that is ideal for cardiac function,” Dr. Hopster said. “However low pressures are not good for the lungs. It’s a balancing act.”

Earlier studies by other researchers have hinted that incorporating helium could be a way of striking this balance. Helium is less dense than oxygen, making it easier to flow through small vessels and reach the alveoli, improving ventilation and gas exchange. Studies in humans have seen beneficial effects.

To see if the same benefits were present in horses, the researchers

examined several measures of good lung function and oxygenation in animals under anesthesia that were given either heliox or pure oxygen. They used six horses owned by Penn for the study. To ensure that the lungs’ alveoli remained open while the horse was in a dorsal position, they performed what is known as an alveoli recruitment maneuver; in essence, slowly stepping up ventilation pressure, keeping the volume of gas constant.

Dr. Hopster and colleagues observed that horses ventilated with heliox rated better for 2 measures of respiratory mechanical function—low peak inspiratory pressure and higher lung compliance—compared with those breathing pure oxygen.

“With helium, you get a more unturbulent flow, so you need a lower pressure to the end of the lungs,” Dr. Hopster said. “You can get the same result in terms of pulmonary function with lower pressures.”

The research was supported by Penn Vet’s Department of Clinical Studies at New Bolton Center. **MeV**

For more information:

Hopster K, Duffee LR, Hopster-Iversen CCS, et al. Efficacy of an alveolar recruitment maneuver for improving gas exchange and pulmonary mechanics in anesthetized horses ventilated with oxygen or a helium-oxygen mixture. *Am J Vet Res.* 2018;79(10):1021-1027.

<https://avmajournals.avma.org/doi/abs/10.2460/ajvr.79.10.1021>

This article first appeared on the Penn Vet website; used with permission.

Leptospira Organisms May Be a Source of Equine Uveitis

Leptospirosis may be a potential cause of equine recurrent uveitis (ERU).

Researchers obtained samples as part of the diagnostic work-up of 66 eyes from 59 client-owned horses with ERU admitted to the Equine Clinic at the University of Liège in Belgium between May 2015 and December 2017. They compared them with 50 healthy postmortem eyes from 28 horses euthanized for unrelated reasons.

In the ERU group, only the affected eyes’ aqueous and vitreous humors were sampled (47/66). In the control group, both the aqueous and vitreous humors were sampled in all 50 eyes. They detected *Leptospira* with polymerase chain reaction (PCR).

The prevalence of *Leptospira* in the ERU group was 30.3% (20/66 eyes from 19 horses), whereas all samples from the control group tested negative. *Leptospira* were identified in 11/63 aqueous and 17/50 vitreous humor samples, with 8 horses testing positive in both humors and 1 horse testing positive in both eyes. **MeV**

For more information:

Sauvage AC, Mondlin SJ, Elansary M, et al. *Equine Vet J.* 2018 Aug 25 [Epub ahead of print].

<https://onlinelibrary.wiley.com/doi/full/10.1111/evj.13012>



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Membership in the AAEVT is open to all veterinary technicians, assistants, support staff and those employed in the veterinary health care industry worldwide. Student membership is open to those currently enrolled in an AVMA/CVMA accredited veterinary technology program.

AAEVT Membership

- Bi-Annual Newsletter
- Weekly "HoofBeats" Email Newsblast
- Full access to www.aaevt.org, including the Career Center and the Library
- Up-to-date information on the AAEVT
- Discounted registration for AAEVT Regional Meetings and the annual AAEP/AAEVT Convention
- NTRA, Working Advantage and Platinum Performance Benefits
- The opportunity to participate in the AAEVT Online Certification Program
- or to become a member of the AAEVT Academy-Specialty in Equine Veterinary Nursing
- Scholarship opportunities.
- AAEVT's *Equine Manual for Veterinary Technicians* (Blackwell Publishing 20% discount on purchase price)
- Opportunity to attend Purina's Annual Equine Veterinary Technician Conference - All Expenses paid!

AAEVT Objectives

- Provide opportunities for CE, training, communication, and networking
- Educate the equine veterinary community and the public about our profession
- Inform Members of issues affecting our profession
- Assist in providing the best medical care to improve the health and welfare of the horse

AAEVT Online Equine Certification Program

- A three course, 10 module, equine-only online program offered through ACT
- Geared toward Credentialed Veterinary Technicians, Assistants, Support staff, & Students
- Areas of study include: equine medical terminology, anatomy and physiology, parasitology, laboratory, diagnostics, equine basics (breeds, wellness, husbandry,) diagnostic procedures, emergency medicine, restraint, pharmacology, surgical assistance and anesthesia, equine office procedures
- A certificate of completion is awarded to those who:
 - Successfully complete required courses
 - Complete the list of required skills (per a supervising DVM who is an AAEP member)
 - Attend an AAEVT regional CE symposium and participate in the we labs
- Those individuals who successfully complete the programs will be recognized as AAEVT Certified Equine Veterinary Technicians / AAEVT Certified Equine Veterinary Assistants depending on their current designation. The certificate is recognized by the AAEVT and the AAEP but does not grant the credentialed status by the AVMA
- For more information go to www.aaevt.4act.com or call 800-357-3182

AAEVT Mission Statement: To promote the health and welfare of the horse through the education and professional enrichment of the equine veterinary technician and assistant.

For more information visit www.aaevt.org

GENE THERAPY

May Someday Be Useful For Equine Lameness

Gene therapy techniques may someday be useful for treating equine lameness, according to a recent study by an international team of scientists and clinicians.

The researchers inserted equine genes for vascular endothelial growth factor (VEGF164) and fibroblast growth factor 2 (FGF2) into a single plasmid DNA into horses that suffered ligament and tendon injuries, the most common injuries to limit a horse's career. Severe injuries can take 15 months to heal.

"Lameness affects not only the

ability to walk but also causes pain. This treatment could potentially be used in not only horses but other animals and humans with ligament and tendon injuries. The treatments available at the moment often do not work, or result in relapse in 60% of the cases or take many months to work," said **Albert Rizvanov**, PhD, DrSci, a professor at Kasan Federal University in Moscow.

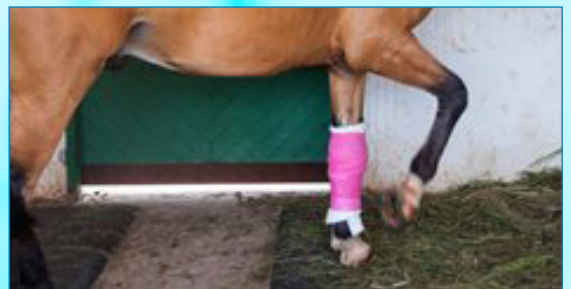
"By using species-specific genes we ensured that proteins which are being synthesized are natural for the horse and won't cause any un-

wanted immune reactions."

Seven horses with middle and severe superficial digital flexor tendon (SDFT) tendonitis and 3 with desmitis of the suspensory ligament branch (SLB) were treated with the gene therapy at the Equine Clinic–New Century of the Moscow State Academy of Veterinary Medicine and Biotechnology, in Russia.

The horses were followed for 12 months with both clinical observation and ultrasonography to evaluate the safety of the procedure as well as the healing. Once the gene

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Providing the injection (left) and several treated horses (right).

therapy was injected inside the injured ligament or tendon, natural horse proteins were produced that helped blood vessels to grow and promote healing.

The researchers saw clinical improvements that were confirmed by ultrasonography in 8 of the 10 horses with SDFT injuries and SLB lesions. All 8 horses were able to return to their pre-injury level of performance within 6 months after the completion of treatment.

While the ninth horse which presented with severe suspensory ligament branch desmopathy appeared less lame, there was no significant ultrasonographic improvements. The tenth horse, which presented with severe SDFT was able to return to its pre-injury level of performance, but suffered a second non-related injury 6 months after treatment. Although reinjuries are common, the second injury was not related to the first one, according to the researchers.

By injecting plasmid DNA into the torn ligaments and tendons, the researchers saw blood vessels develop within the tissue, and the tissue grew back without leaving scar tissue behind. The team also identified how the genes repair the tissue and the underlying mechanisms.

This work has been carried out as part of a collaborative research project between academics in the University of Nottingham School of Veterinary Medicine and Science and Kazan Federal University and Moscow State Academy.

"This innovative work is truly

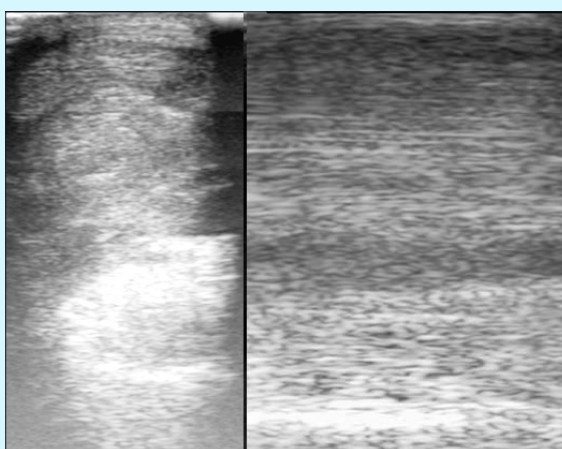
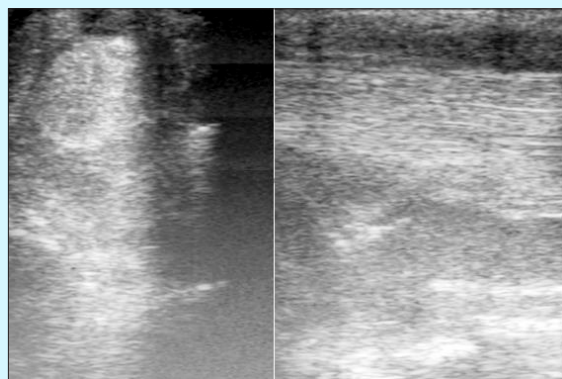
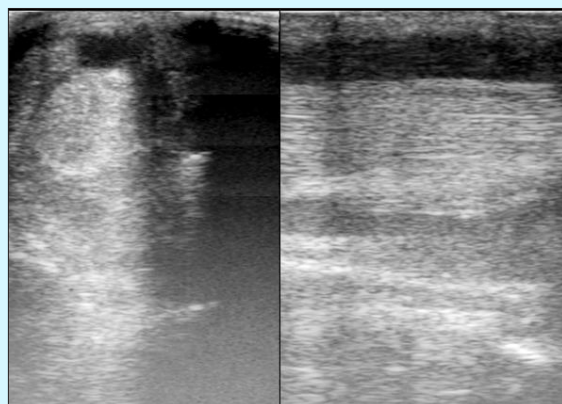
exciting, not just for veterinary medicine but also in human medicine. Seeing the quick recovery period, the pain relief to the injured animals and watching the blood vessels develop to help the tissue repair was amazing. It gave us real insights into how and why these techniques work," said **Catrin Rutland**, BSc, PGCHE, MSc, MMedSci, PhD, SFHEA, FAS, an associate professor of Anatomy and Developmental Genetics at The University of Nottingham.

The team had previously reported on 2 horses that had received cutting-edge treatment, but this pioneering larger study helps to show the results in SFDTs and the SLB damage to these 2 areas can cause chronic and debilitating lameness.

"The horses used in our study had gone lame naturally but with the treatment, most of them were back to their previous levels of movement and fitness within a very short period and were no longer in pain. In addition we did not see the high levels of lameness reoccurring in our patients.

"The most promising treatments emerging have a 20% relapse rate but also take 5–6 months to work. Our gene therapy worked within just a few weeks. Therefore, it has a high rate of healing, a low chance of relapse and works quickly—a significant medical discovery," said **Milomir Kovac**, DVM, MSc, PhD, a veterinary surgeon at the Moscow State Academy of Veterinary Medicine and Biotechnology.

MeV



Ultrasonography of 1 horse shows pretreatment, days 20 and day 40 posttreatment.

Images courtesy of Dr. Catrin Rutland.

For more information:

Kovac M, Litvin YA, Aliev RO, et al. Gene therapy using plasmid DNA encoding VEGF164 and FGF2 genes: A novel treatment of naturally occurring tendinitis and desmitis in horses. *Front Pharmacol*. 2018 Published Aug 31.

<https://www.frontiersin.org/articles/10.3389/fphar.2018.00978/full>.

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