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Repeat Celiotomy Might Be Worthwhile

Ask the Nutritionist? Guidelines for Feeding a Horse After Colic

PRP Shows Promise for Synovitis

Taking the Oral Exam to the Next Level

NEW FEATURE: ASK THE NUTRITIONIST? YOUR NUTRITION QUESTIONS ANSWERED

TABLE OF CONTENTS

COVER STORY

4 **Repeat Celiotomy Might Be Worthwhile**

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ASK THE NUTRITIONIST?

What Are Some Guidelines for Feeding a Horse After Colic? 7

INFECTIOUS DISEASE

PRP Shows Promise for Synovitis 12

DENTISTRY

No More Lip Flipping: Take the Oral Exam to the Next Level 14

NEWS

Underestimating the Extent of Peripheral Caries 3

New Light Shed on Hoof Growth 10

Effects of Osteochondral Fragmentation of the Carpus on Racing 13

Reining in Effects of Free-Roaming Horses 15

ADVERTISERS

AVMA | PLIT 3
Heska 5
Purina Sponsored Content 7
Merck Animal Health 9
Standlee Premium Western Forage 11

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Underestimating the Extent of Peripheral Caries

Equine peripheral caries (PC) cause different cemental lesion patterns that may depend on the route of bacterial invasion, a new study found. Gross examination can underestimate the extent of PC.

The researchers examined cheek teeth affected by PC histologically and structurally to establish the route of cariogenic bacterial invasion and to describe the resulting pathological changes.

A total of 16 cheek teeth from horses that had died of nondental-related disease with varying grades of PC were examined alongside four control teeth without signs of PC. The teeth were macroscopically assessed. Of those with PC, 11 had partial cemental caries (grade 1.1 PC), 3 had total cemental caries (grade 1.2 PC), 3 had caries of cementum and the underlying enamel (grade 2 PC) and 2 had caries of cementum, enamel and dentine (grade 3 PC). Samples for histological and electron microscopy examinations were prepared.

Bacteria from plaque entered the peripheral cementum perpendicular to the sides of the teeth alongside Sharpey's fibers or vascular channels or more horizontally alongside exposed intrinsic fibers and cemental growth lines. Intra-cemental bacterial spread caused varying patterns of cemental caries as identified histologically: horizontal flake-like lesions (Type A), vertical flake-like lesions (Type B), flask-like lesions (Type C) and small ellipsoid, lytic lesions (Type D). Regardless of mechanism, cariogenic bacteria commonly tracked along the intrinsic fibers in lines of arrested growth (LAGs), causing further demineralization of adjacent cementum and disintegration of these fibers. Cemental caries progressed to affect enamel, dentine and pulp, the researchers said. **MeV**

For more information:

Borkent D, Smith S, Dixon PM. A histological and ultrastructural study of equine peripheral caries. *Equine Vet J.* 2019 Apr 30 (Epub ahead of print).
https://onlinelibrary.wiley.com/doi/10.1111/evj.13134

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Repeat Celiotomy Might Be Worthwhile

Those with smaller lesions might be better candidates for repeat procedures.

For owners deciding whether to take a horse for repeat celiotomy for postoperative colic, the process can be overwhelming. Regardless of the prognosis, the decision will be a costly one, and owners will likely seek the opinion of the referring veterinarian and surgeon before making it.

So, what should you tell them?

At first glance, medical management would seem the most cost-effective initial approach—especially since prognosis for repeat celiotomy appears to be poor—but that is not always the case, according to **Anje G. Bauck**, DVM, DACVS-LA, a veterinarian at the University of Florida, College of Veterinary Medicine.

Part of the problem is that

By Marie Rosenthal, MS

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Imaging the Possibilities

HESKA

there are no specific guidelines to help veterinarians choose the horse most likely to do well after a second surgery. Dr. Bauck and her colleagues looked at second celiotomies after jejunocecostomy and shared some of the characteristics that they found that could improve the prognosis.

They examined horses undergoing jejunocecostomy, including a subset that underwent repeat celiotomy. Not all of the horses did well; three horses undergoing repeat celiotomy were euthanized during the second surgery for either humane or financial reasons. However, the 19 horses that recovered from general anesthesia after repeat celiotomy survived, and the median time to survival was 90 months.

"At our hospital, candidates for repeat celiotomy include horses where the original lesion was a small intestinal strangulation, treated with or without resection that then developed postoperative reflux or postoperative colic," she said at the AAEP annual meeting.

Improving Prognosis

The prognosis is better if the second surgery is performed sooner, rather than later, she added. Surgeries should be done within 48 hours of clinical signs of either postoperative reflux or postoperative colic.

Many people attribute postoperative reflex to postoperative ileus, she said, because there are no distinguishing features to help diagnose POI. However, her practice tends to attribute postoperative reflux to technical or mechanical failures of the surgery. And that can be a difficult thing for the surgeon to accept.

"But we believe this really does have to be overcome, because there are opportunities to fix the problem," she said.

POI actually "represents only a small percentage of all reflux after colic surgery, and the data that we have reported on does support this argument," she said.

But the repeat surgery is not without risk. Before any veterinarian can make a recommendation, he or she must weigh the risks and the benefits, she said, and should be upfront with the owner about those risks and benefits. A consultation with an experienced surgeon is also warranted—and if possible—he or she should also be involved in

Continued on page 8

Ask the Nutritionist

BY KELLY VINEYARD, MS, PhD

Ask the Nutritionist *is a new monthly column featuring questions answered by PhD equine nutritionists and sponsored by Purina Animal Nutrition.*

Have a nutrition question you want to see featured? Email the editor. For clinics looking for specific nutritional advice, visit purinamills.com/ask-an-expert.

What are some guidelines for feeding a horse after colic?

Developing a post-colic feeding plan depends on the nature of the colic episode, and whether surgery was performed or not.

Simple colic (i.e. no specific diagnosis): Horses may return to a normal feeding regimen fairly quickly. Food and water should be withheld during the episode, and normal feeding may be resumed once the horse is passing feces and no longer painful. It's recommended to offer forage but reduce or withhold concentrate for 1–2 days to prevent excess gas production. Ensure adequate hydration and review the horse's feed and general management practices to identify potential problems.

Small intestinal resection: The introduction of feed and water should only occur if there is evidence of gastric motility and no gastric reflux. In order to minimize stress at the anastomosis site, feed small, frequent meals (1–2lbs. every 3–4 hours) of a soft, low-bulk ration. Suitable feeds include fresh grass while hand grazing and slurries made with a complete pelleted ration such as Purina® Equine Senior®, alfalfa pellets, or an enteral diet such as Purina® Wellsolve® Well-Gel. Good quality long-stem hay can slowly be re-introduced after 3–4 days.

Large intestinal resection: Introduction of feed and water should only occur if there is evidence of gastric motility and no gastric reflux. Similar to the recommendations following small intestinal resection, feed small, frequent meals (1–2lbs., every 3–4 hours) of easily digestible forage or pelleted complete feed post-surgery. Ad-lib alfalfa hay can usually be fed 24 hours following the initial offering. Diarrhea is a common complication following surgery and feeding small amounts of high-quality grass hay at frequent intervals may help resolve the issue. Grain concentrates should be avoided for approximately 10–14 days following surgery.

Impaction, strangulation, and obstruction colic: Offer water and a diet of fresh grass, alfalfa pellets, alfalfa hay, or pelleted complete feed (such as Equine Senior) once the colic has been resolved and fecal transit is confirmed. Feeding 1 lb. every 3 hours allows the monitoring of intake-and-response of intestinal motility. Ad-lib hay can normally be offered 24 hours after the initial offering. Grain concentrates should be avoided until at least 10–14 days post-surgery, at which point a normal diet may be resumed if the horse is responding well. In the special case of enteroliths, alfalfa hay should not be fed in the future.

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ABOUT THE AUTHOR

Dr. Kelly Vineyard is a Senior Nutritionist, Equine Technical Solutions, with Purina Animal Nutrition. She is responsible for providing expert technical nutrition advice and insights in a variety of areas, including new product innovation and research, and veterinarian and customer technical support.

Continued from page 6

When to Provide Food and Water After Colic Surgery

For many colic cases, **Anje G. Bauck,** DVM, DACVS-LA, begins providing water and feed relatively soon.

Water is given about 12 hours postsurgery, but only a few sips at a time. "If they don't appear to be gulping it down then we'll give them free choice," she said.

For a small intestinal section resection, feeding can probably start between 18 to 34 hours. Her preferred feed is fresh grass, although in some areas that is not always possible.

the second procedure, she recommended.

"In horses with postoperative reflux, there are three basic treatment options to consider. One would be early surgical treatment, if the second surgery is successful, then postoperative care tends to be less expensive and the outcomes generally quite good," Dr. Bauck said.

The second option would be medical therapy. "If prolonged, medical therapy can become more expensive and may be associated with lower prognosis," she said. "And finally, if prolonged medical therapy is not successful, and they have now been refluxing for five days, then you're left with the only option of repeat celiotomy after an already prolonged period of medical intervention.

"So, in delaying that surgery initially, you do run the risk of needing surgery anyway. At that point, you've already compromised the outcome and increased the bill. So again, it's a matter of weighing the different risks and the cost of all these options," Dr. Bauck explained.

Between 4.7% and 14.6% of all colic surgeries—most involving small intestinal lesions—require repeat celiotomy. Short-term survival among horses recovered from anesthesia ranges from 27% to 80%, and long-term survival ranges between 12% and 40%, she said.

"If they do not improve within 48 hours of the onset of clinical signs, then we will recommend taking these horses back to surgery," she said. "We will inform owners and referring veterinarians that repeat celiotomy might be required as soon as a complication develops. This helps prevent delays and decision making by giving all parties ample time to consider their options."

In horses that had a jejunocecostomy at the first surgery, 82% of those were corrected with a repeat anastomosis at the second surgery. In cases that did not have a resection at the first surgery, 50% of those received a resection and anastomosis at the second surgery. In both of those groups, if an anastomosis was either not performed or revised at the second surgery, then the lesion was corrected and the distended small intestine was decompressed into the secum.

Jejunocecostomies are more complicated, but the technique is important, she said. A single layer Lambert/oppositional pattern with minimal inversion is recommended because it should lower the rate of reflux. "In cases that jejunocecostomy or no resection at that first surgery, we saw that 9% of that population required repeat celiotomy, 86% were recovered from anesthesia following the second surgery and 100% survived to discharge," she said.

In the cases with a jejunocecostomy at first surgery, 22% required a repeat celiotomy and 71% survived to discharge.

"We saw that a second surgery reduced clinical signs in all groups and completely eliminated signs of postoperative colic," she said. "We also saw that the second surgery reduced or eliminated postoperative reflux in the majority of cases."

Dr. Bauck said that it was important that owners know up front that postsurgical complications could lead to a second surgery, and that the outcomes are better if the surgery is performed soon after the postsurgical signs appear. That can help them make that decision more quickly and improve the horse's odds, she explained. While some of these horses could respond to prolonged medical intervention, delaying surgery does decrease the prognosis, so that has to be weighed against the risk and the cost of a second surgery.

"We concluded that early repeat celiotomy can have a favorable outcome and should be considered as a strategy to reduce the suffering and harmful effects of protracted small intestinal dissension, which does increase the risk of adhesions," she said.

The bottom line is: "The negative attitude toward the effect of repeat celiotomy should be tempered with the understanding that many of these horses would have died without a second surgery," she said. **MeV**

For more information:

Bauck AG, Easley JT, Cleary OB, et al. Response to early repeat celiotomy in horses after a surgical treatment of jejunal strangulation. *Vet Surg.* 2017 May 29 (Epub ahead of print).

https://onlinelibrary.wiley.com/doi/abs/10.1111/vsu.12670

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[1] Data on file, Merck Animal Heath

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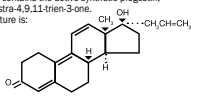
Regu-Mate® (altrenogest)

Solution 0.22% (2.2 mg/mL)

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

DESCRIPTION: Regu-Mate® (altrenogest) Solution 0.22% contains the active synthetic progestin, altrenogest. The chemical name is 17α -allyl-17ß-hydroxyestra-4,9,11-trien-3-one. The CAS Registry Number is 850-52-2. The chemical structure is:



Each mL of Regu-Mate® (altrenogest) Solution 0.22% contains 2.2 mg of altrenogest in an oil solution.

ACTIONS: Regu-Mate® (altrenogest) Solution 0.22% produces a progestational effect in mares.

INDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is indicated to suppress estrus in mares. Suppression of estrus allows for a predictable occurrence of estrus following drug withdrawal. This facilitates the attainment of regular cyclicity during the transition from winter anestrus to the physiological breeding season. Suppression of estrus will also facilitate management of prolonged estrus conditions. Suppression of estrus may be used to facilitate scheduled breeding during the physiological breeding season.

CONTRAINDICATIONS: Regu-Mate® (altrenogest) Solution 0.22% is contraindicated for use in mares having a previous or current history of uterine inflammation (i.e., acute, subacute, or chronic endometritis). Natural or synthetic gestagen therapy may exacerbate existing low-grade or "smoldering" uterine inflammation into a fulminating uterine infection in some instances.

PRECAUTIONS: Various synthetic progestins, including altrenogest, when administered to rats during the embryogenic stage of pregnancy at doses manyfold greater than the recommended equine dose caused fetal anomalies, specifically masculinization of the female genitalia.

DOSAGE AND ADMINISTRATION: While wearing protective gloves, remove shipping cap and seal; replace with enclosed plastic dispensing cap. Remove cover from bottle dispensing tip and connect luer lock syringe (without needle). Draw out appropriate volume of Regu-Mate solution. (Note: Do not remove syringe while bottle is inverted as spillage may result.) Detach syringe and administer solution orally at the rate of 1 mL per 110 pounds body weight (0.044 mg/kg) once daily for 15 consecutive days. Administer solution directly on the base of the mare's tongue or on the mare's usual grain ration. Replace cover on bottle dispensing tip to prevent leakage. Excessive use of a syringe may cause the syringe to stick; therefore, replace syringe as necessary.

WHICH MARES WILL RESPOND TO REGU-MATE® (altrenogest) SOLUTION 0.22%: Extensive clinical trials have demonstrated that estrus will be suppressed in approximately 95% of the mares within three days; however, the post-treatment response depended on the level of ovarian activity when treatment was initiated. Estrus in mares exhibiting regular estrus cycles during the breeding season will be suppressed during treatment; these mares return to estrus four to five days following treatment and continue to cycle normally. Mares in winter anestrus with small follicles continued in anestrus and failed to exhibit normal estrus following withdrawal.

Response in mares in the transition phase between winter anestrus and the summer breeding season depended on the degree of follicular activity. Mares with inactive ovaries and small follicles failed to respond with normal cycles post-treatment, whereas a higher proportion of mares with ovarian follicles 20 mm or greater in diameter exhibited normal estrus cycles post-treatment. Regu-Mate® (altrenogest) Solution 0.22% was very effective for suppressing the prolonged estrus behavior frequently observed in mares during the transition period (February, March and April). In addition,
a high proportion of these mares responded with regular estrus cycles post-treatment.

SPECIFIC USES FOR REGU-MATE® (altrenogest) SOLUTION 0.22%:
SUPPRESSION OF ESTRUS TO:

1. Facilitate attainment of regular cycles during the transition period from winter anestrus to the physiological breeding season. To facilitate attainment of regular cycles during the transition phase, mares should be examined to determine the degree of ovarian activity. Estrus in mares with inactive ovaries (no follicles greater than 20 mm in diameter) will be suppressed but these mares may not begin regular cycles following treatment. However, mares with active ovaries (follicles greater than 20 mm in diameter) frequently respond with regular post-treatment estrus cycles.
2. Facilitate management of the mare exhibiting prolonged estrus during the transition period. Estrus will be suppressed in mares exhibiting prolonged behavioral estrus either early or late during the transition period. Again, the posttreatment response depends on the level of ovarian activity. The mares with greater ovarian activity initiate regular cycles and conceive sooner than the inactive mares. Regu-Mate® (altrenogest) Solution 0.22% may be administered early in the transition period to suppress estrus in mares with inactive ovaries to aid in the management of these mares or to mares later in the transition period with active ovaries to prepare and schedule the mare for breeding.

DOSAGE CHART:

Approximate Weight in Pounds	Dose in mL
770	7
880	8
990	9
1100	10
1210	11
1320	12

3. Permit scheduled breeding of mares during the physiological breeding season. To permit scheduled breeding, mares which are regularly cycling or which have active ovarian function should be given Regu-Mate® (altrenogest) Solution 0.22% daily for 15 consecutive days beginning 20 days before the date of the planned estrus. Ovulation will occur 5 to 7 days following the onset of estrus as expected for nontreated mares. Breeding should follow usual procedures for mares in estrus. Mares may be regulated and scheduled either individually or in groups.

ADDITIONAL INFORMATION: A 3-year well controlled reproductive safety study was conducted in 27 pregnant mares, and compared with 24 untreated control mares. Treated mares received 2 mL Regu-Mate® (altrenogest) Solution 0.22% / 110 lb body weight (2x dosage recommended for estrus suppression) from day 20 to day 325 of gestation. This study provided the following data:

1. In filly offspring (all ages) of treated mares, clitoral size was increased.
2. Filly offspring from treated mares had shorter interval from Feb. 1 to first ovulation than fillies from their untreated mare counterparts.
3. There were no significant differences in reproductive performance between treated and untreated animals (mares & their respective offspring) measuring the following parameters:
   - interval from Feb. 1 to first ovulation, in mares only.
   - mean interovulatory interval from first to second cycle and second to third cycle, mares only.
   - follicle size, mares only.
   - at 50 days gestation, pregnancy rate in treated mares was 81.8% (9/11) and untreated mares was 100% (4/4).
   - after 3 cycles, 11/12 treated mares were pregnant (91.7%) and 4/4 untreated mares were pregnant (100%).
   - colt offspring of treated and control mares reached puberty at approximately the same age (82 & 84 weeks respectively).
   - stallion offspring from treated and control mares showed no differences in seminal volume, spermatozoal concentration, spermatozoal motility, and total sperm per ejaculate.
   - stallion offspring from treated and control mares showed no difference in sexual behavior.
   - testicular characteristics (scrotal width, testis weight, parenchymal weight, epididymal weight and height, testicular height, width & length) were the same between stallion offspring of treated and control mares.

REFERENCES:
Shoemaker, C.F., E.L. Squires, and R.K. Shideler. 1989.Safety of Altrenogest in Pregnant Mares and on Health and Development of Offspring. Eq. Vet. Sci. (9): No. 2: 69-72.
Squires, E.L., R.K. Shideler, and A.O. McKinnon. 1989.Reproductive Performance of Offspring from Mares Administered Altrenogest During Gestation. Eq. Vet. Sci. (9): No. 2: 73-76.

WARNING: Do not use in horses intended for food.

HUMAN WARNINGS: Skin contact must be avoided as Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed through unbroken skin. Protective gloves must be worn by all persons handling this product. Pregnant women or women who suspect they are pregnant should not handle Regu-Mate® (altrenogest) Solution 0.22%. Women of child bearing age should exercise extreme caution when handling this product. Accidental absorption could lead to a disruption of the menstrual cycle or prolongation of pregnancy. Direct contact with the skin should therefore be avoided. Accidental spillage on the skin should be washed off immediately with soap and water.

INFORMATION FOR HANDLERS:
WARNING: Regu-Mate® (altrenogest) Solution 0.22% is readily absorbed by the skin. Skin contact must be avoided; protective gloves must be worn when handling this product.

Effects of Overexposure: There has been no human use of this specific product. The information contained in this section is extrapolated from data available on other products of the same pharmacological class that have been used in humans. Effects anticipated are due to the progestational activity of altrenogest. Acute effects after a single exposure are possible; however, continued daily exposure has the potential for more untoward effects such as disruption of the menstrual cycle, uterine or abdominal cramping, increased or decreased uterine bleeding, prolongation of pregnancy and headaches. The oil base may also cause complications if swallowed. In addition, the list of people who should not handle this product (see below) is based upon the known effects of progestins used in humans on a chronic basis.

PEOPLE WHO SHOULD NOT HANDLE THIS PRODUCT.

1. Women who are or suspect they are pregnant.
2. Anyone with thrombophlebitis or thromboembolic disorders or with a history of these events.
3. Anyone with cerebral-vascular or coronary artery disease.
4. Women with known or suspected carcinoma of the breast.
5. People with known or suspected estrogen-dependent neoplasia.
6. Women with undiagnosed vaginal bleeding.
7. People with benign or malignant tumors which developed during the use of oral contraceptives or other estrogen-containing products.
8. Anyone with liver dysfunction or disease.

ACCIDENTAL EXPOSURE: Altrenogest is readily absorbed from contact with the skin. In addition, this oil based product can penetrate porous gloves. Altrenogest should not penetrate intact rubber or impervious gloves; however, if there is leakage (i.e., pinhole, spillage, etc.), the contaminated area covered by such occlusive materials may have increased absorption. The following measures are recommended in case of accidental exposure.
Skin Exposure: Wash immediately with soap and water.
Eye Exposure: Immediately flush with plenty of water for 15 minutes. Get medical attention.
If Swallowed: Do not induce vomiting. Regu-Mate® (altrenogest) Solution 0.22% contains an oil. Call a physician. Vomiting should be supervised by a physician because of possible pulmonary damage via aspiration of the oil base. If possible, bring the container and labeling to the physician.

CAUTION: For oral use in horses only. Keep this and all medication out of the reach of children.

Store at or below 25°C (77°F).

NADA# 131-310, Approved by FDA.

HOW SUPPLIED:
Regu-Mate® (altrenogest) Solution 0.22% (2.2 mg/mL).
Each mL contains 2.2 mg altrenogest in an oil solution.
Available in 1000 mL plastic bottles.

* US Patents 3,453,267; 3,478,067; 3,484,462

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New Light Shed on Hoof Growth

A clearer understanding of how hard tissue—such as horse hoof—grows could unify a disparate set of conditions and clarify the roles of the animal's physical and biologic condition, according to equine researchers who collaborated with experts in various fields to better understand why abnormal hoof shapes develop.

"With new scientific input from physics, mathematics and biology, this study provides an entirely new paradigm regarding hard growing tissues such as the horse hoof, which can be applied across cattle, sheep and other species, to unify a set of apparently disparate conditions and clarify the roles of physics and/or biology," said **Cyril Rauch**, PhD, BSc, MSc, DEA, associate professor in Physical and Mathematical Veterinary Medicine & Science, Faculty of Medicine & Health Sciences at the University of Nottingham in the United Kingdom.

"We believe that this novel approach has the potential to provide alternative directions to follow with respect to understanding chronic hoof pathologies," added **Nicola Menzies-Gow**, MA, VetMB, PhD, DECEIM, Cert EM (int med), MRCVS, of the Royal Veterinary College in the United Kingdom.

They tested hooves from horses euthanized for nonresearch purposes in various ways from imaging to histapathology and showed that the hoof growth rate can be greater than the potential epithelial cell proliferation rate. In addition, the synthesis of the hoof capsule starts from the coronet, and the soft papillae undergo gradual transition through 3 interpapillary regions into hard keratinized tissue.

They also found that the dorsal hoof wall can grow in a curve rather than straight as a result of faster growth from the coronary band at the quarters compared with the toe region.

They evaluated the feet from live underweight and obese subjects to see the influence of body weight on hoof growth. The results suggest that being heavier may promote straighter hoof growth while being too lean may precipitate poor hoof growth and the development of a hoof with a dorsal curve.

Photos courtesy of the Journal of the Royal Interface

Trying to understand chronic hoof pathologies.

A high concentration of insulin stimulated equine progenitor keratinocytes to grow in culture. If this also happens chronically within the live animal, it could affect the growth stresses within the hoof and promote a dorsal-curved hoof shape, they said.

Given that the hoof is weight bearing, "it is essential to untangle the biology from the physics in this system; only then can meaningful biological and/or physical causes be prescribed for a particular hoof shape. Removing the cause(s) when physically or biologically possible is essential to resolve hoof conditions," Dr. Rauch explained.

The School of Veterinary Medicine and Science at University of Nottingham collaborated with the WALTHAM Centre for Pet Nutrition and the Royal Veterinary College. **MeV**

For more information:

Al-Agele R, Paul E, Taylor S, et al. Physics of animal health: On the mechanobiology of hoof growth and form. *Journal of the Royal Society Interface*. 2019 July 15. **http://doi.org/10.1098/rsif.2019.0214**

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PRP SHOWS PROMISE for Synovitis

By Paul Basilio

Intra-articular platelet-rich plasma (PRP) has been growing in frequency as both a subject of research and as an attractive clinical option for various equine joint disorders. Evidence for specific compositions for PRP as a potential treatment for synovitis, however, is lacking.

A team of researchers from the Louisiana State University School of Veterinary Medicine recently set out to determine whether PRP had a beneficial impact on this common form of lameness in horses.

The Premise

"Alpha granules within platelets contain growth factors that are released when platelets are activated," said **Cole B. Sandow**, DVM, MS, one of the LSU investigators. "Therefore, if we can process the patient's whole blood to obtain a product with a high concentration of platelets, it could deliver those growth factors to the site of injury and potentially improve healing."

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While many growth factors are involved, the transformation of growth factor beta (TGF-β1) may have implications in joint therapy through the ability to increase extracellular matrix synthesis and promote chondrocyte differentiation.

"PRP use in horses has [primarily] been with soft tissue injuries involving the tendons and ligaments, as well as some wound applications," he said. "One of the earlier uses of PRP in horses for osteoarthritis was back in 2007, and like many other therapies in equine medicine, its clinical use outpaced controlled research."

Six geldings (5 Thoroughbreds and 1 Quarter Horse) between the ages of 6 and 12 years were used in the study. All horses underwent serial synovial fluid and lameness examinations, including palpation and static flexion of the distal limbs.

The right or left metacarpophalangeal joint was selected randomly. Synovial fluid was obtained, and a lameness examination was performed. A transient, self-limiting synovitis was induced using a lipopolysaccharide—similar to other studies.

Horses then randomly received either an intra-articular injection of leukocyte-poor PRP (LP-PRP) or saline, followed by additional lameness examinations and synovial fluid collections at 24, 48, 72 and 96 hours. After a 2-week washout period, the opposite treatment was administered to the other limb.

The Results

Results showed that LP-PRP administration did lower lameness scores at hours 24 and 48, but no changes in the synovial environment occurred. No adverse reac-

tions were noted.

"There was a significant time effect resulting in increased lameness scores following induction of synovitis at hour 0 that resolved by hour 96," Dr. Sandow said. "There was also a significant treatment effect following administration of LP-PRP."

A significant increase in total protein and total cell count was seen following inductions of synovitis that returned to normal levels at hour 48, but no differences were noted between the treatment and saline groups for this effect.

"Some of the reasons for the lack of improvement in the synovial environment could be due to the fact that LP-PRP has been shown to be more anabolic rather than anti-inflammatory," Dr. Sandow said. "A different synovitis model also may have offered different results."

He pointed out that in human literature, researchers have advocated for a series of 3 injections rather than a single injection.

Considerations

Some factors to consider before using PRP as an intra-articular therapy include a cost-benefit analysis, as there are intra-articular medications available that are less expensive. Human literature also notes that case selection is important—PRP may be of more benefit in early or mild cases of osteoarthritis, for example.

In addition, the composition of PRP appears to be important, and further research will need to be conducted to determine the optimal make-up. **MeV**

Getting the Right Mixture

There are several commercial kits and laboratory protocols for producing PRP, but their compositions may vary.

In a 2012 paper published in the journal *Arthroscopy*, **Jeffrey DeLong**, BSc, and colleagues created the PAW classification system based on 3 components:

1. Absolute number of platelets
2. The manner in which platelet activation occurs (ie, endogenously or through the addition of calcium chloride or thrombin)
3. The presence or absence of white cells.

By analyzing those 3 variables, they were able to accurately compare PRP protocols.

"It's been suggested that the composition should depend on the disease process that's being treated." Dr. Sandow said, "Whether it's a joint or soft tissue injury, for example."

Additional research in horses has shown that increased platelet concentrations have a variable correlation to the growth factors TGF-β as well as platelet-derived growth factor. However, more platelets is not necessarily better, as high concentrations have been shown to have a negative effect on bone and may result in fibrosis of the joint capsule.

PRP may also be endogenously activated on exposure to the synovial fluid, so an activator may not be necessary.

"Probably the most hotly debated topic regarding PRP composition is the WBC concentration," he added. "However, there's more evidence to support a leukocyte-poor PRP (LP-PRP), as high-leukocyte counts had negative effects on cartilage and meniscal explants, and they had a positive correlation to catabolic enzymes."

Effects of Osteochondral Fragmentation of the Carpus on Racing

Researchers found significant differences between the location and severity of osteochondral fragmentation lesions in Quarter Horses compared with Thoroughbreds. Although most horses returned to racing following surgery for the lesions, the lesion severity affected performance.

This retrospective study aimed to identify associations between the severity and location of osteochondral fragments in the carpus and to describe the racing performance of horses pre- and post-arthroscopic removal in Thoroughbreds and Quarter Horses. Although osteochondral fragmentation of the carpus is a common cause of lameness among racehorses, there are few reports on the prognosis and careers of horses after the fragments have been removed arthroscopically, they said. The last report was in 1987.

There are few reports on the prognosis and careers of horses after fragments have been removed.

The medical and racing records of racehorses that underwent carpal arthroscopy between 2006 and 2016 due to clinical signs and radiographic findings consistent with carpal chip fragmentation were reviewed retrospectively. Signalment, location of fragmentation and grade of defect after arthroscopic removal and debridement were described, and they identified factors associated with an unsuccessful return to racing.

In total, 828 horses (416 Quarter Horses and 412 Thoroughbreds) underwent 880 carpal arthroscopies for removal of fragments. A total of 65% and 27% of lesions were bilateral in Quarter Horses and Thoroughbreds, respectively, with the most commonly affected bone in both breeds being the dorsodistal radial carpal bone. Overall, 82% of horses raced postsurgery, with 69.5% racing at the same or a higher level. Factors associated with horses not returning to racing postsurgery were increasing horse age, being female, and a lesion grade of 4/4, while racing presurgery appeared protective. **MeV**

For more information:

Graham RJTY, Rosanowski SM, McIlwraith. A 10-year study of arthroscopic surgery in racing Thoroughbreds and Quarterhorses with osteochondral fragmentation of the carpus. *Equine Vet J*. 2019 June 22 (Epub ahead of print).

https://onlinelibrary.wiley.com/doi/10.1111/evj.13145

NO MORE LIP FLIPPING: Take the Oral Exam to the Next Level

The era of an equine oral examination that consists solely of flipping a horse's lip to see if there are any sharp points on the teeth is officially over.

The most recent owners' survey from the American Association of Equine Practitioners shows that today's expectations include a thorough examination in which information is shared with the clients. Performing and documenting a thorough oral examination can lay the foundation of trust in a veterinarian-client relationship, and it can elevate the veterinarian in the owner's eyes, according to **Claudia R. True**, DVM, of the Woodside Equine Clinic in Ashland, Va.

"Educating clients is important," Dr. True said. "We all have clients who aren't at the barn, but we usually see the trainers. If I find something in a horse's mouth, I grab the trainer and show them as soon as I can. Pretty soon those trainers and owners will see that you are doing more than just floating teeth."

Beginning the Exam

Just like a colic, lameness or neurologic exam, Dr. True recommended a complete systematic approach to the oral examination.

"It's important to listen to a horse before we sedate it," she said. "I want to make sure that it sounds okay. Does it have atrial fibrillation? Does the GI tract sound okay?"

If a horse has a fever in a non-emergency situation, she stated that it may be best to put off the sedation until the fever resolves.

After auscultation, Dr. True will take a step back and look at the horse head-on to check for ocular or nasal discharge, check for symmetry, examine the bone structure, and look for muscle atrophy or hypertrophy.

"I'm going to be looking between the horse's eyes to see if one is lower than the other, and I'm looking at the facial crest for asymmetry," she said. "That may give me a hint as to what's going on in the horse's mouth."

If a horse is relatively calm, she'll start palpating the head, paying close attention to the parotid and thyroid glands, followed by an additional symmetry check. After that, it's on to the temporomandibular joints to check for effusion or pain. If pain is present, she'll go from one side to the other to locate the pain. Finally, she'll check the masseter muscles for pain and symmetry.

"I'll also go up to the temporalis muscles above the eyes, and then I'll go over the mandibles," she said. "I want to make sure the horizontal and vertical mandibles are both palpated to check for bony changes, pain, heat or swelling."

Following sedation, she'll place her fingers in the interdental space to check for any potential bitting issues and blind or unerupted wolf teeth.

Prior to placement of the speculum, she'll take a good look at the incisors to check for fractures or signs

By Paul Basilio

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of equine odontoclastic tooth resorption and hypercementosis (EOTRH) to avoid causing the horse more pain during the examination.

Poking and Probing

After the speculum is placed and the horse's head is resting on the headstand, Dr. True will begin feeling the teeth for sharp enamel points.

"I'm also feeling the cheeks for major abrasions and checking for malocclusions and misaligned teeth," she explained. "After rinsing out the horse's mouth, there also still may be feed stuck in the diastema. I'll go in a clockwise manner from the 100 to the 200, 300, and 400 arcades, then take my hand out and get a good look in the mouth, starting with the soft tissue."

Before she brings out her mirror or oral endoscope, Dr. True checks the tongue for abrasions, growths or foreign bodies, such as grass awns that have been tucked away. The sublingual salivary ducts are checked for inflammation, and the hard and soft palates get a once-over as well.

At this point in the examination, Dr. True takes out her mirror or oral endoscope and gets a closer look at the periodontium for signs of gingival recession of the cheek teeth. If recession is present, she will use a periodontal probe in the pocket—a pocket >5 mm gets a closer examination and radiographs in some cases.

"Make sure to look at the buccal side of the teeth in addition to the palatal and lingual sides," Dr. True said. "You can find periodontal pockets packed full of food that you may miss [otherwise]."

She also examines the endodontium, cementum and enamel with an explorer to check for exposed pulp horns and other defects. Exposed pulp horns typically appear lighter when compared with the others.

Cheek teeth infundibulae are a common area for caries. If present, these lesions should be noted in the record.

After any necessary odontoplasty, Dr. True takes the speculum out of the horse's mouth to get a better look at the incisors.

"I want to count the teeth," she said. "I want to make sure there are 6 on top and 6 on the bottom, and then check for periodontal disease or draining tracts that may indicate a bad tooth." **MeV**

History Buff

A thorough history from the caretaker can inform and guide the oral examination. Some important questions to ask include:

- Does the horse have any difficulty chewing?
- Is it dropping food or quidding?
- If yes, does this change depending on what is eaten?
- Does the horse tilt or shake its head when eating or when ridden?
- Is there a history of weight loss?
- Does the horse avoid contact with the bit?
- Has there been a change in the bits that are used?

"I want to talk to the owner about the health of the horse," Dr. True said. "I want to know their concerns and what they think the problem is. Sometimes what we find isn't always what the client thinks the problem is. I've had horses come in for oral exams that have had neck arthritis or some kind of other lamenesss issue. I try to be a good listener and try to listen to what the client is telling me about the horse to see if it is truly something that we can find on an oral exam."

Reining in the Ecological Effects of Free-Roaming Horses

Free-roaming horses are an icon of the American West, but viewed through an ecological lens, these animals present a different picture—one of degraded landscapes and shrinking biodiversity.

Kirk W. Davies, PhD, Agricultural Research Service in Georgia, and **Chad S. Boyd**, PhD, Rangeland Scientist with USDA-ARS, in Oregon, reviewed the ecological threats posed by free-roaming horses, which include soil compaction, overgrazing and domination over scarce water resources. Areas where they are excluded have 2 to 3 times greater native grass cover. "Free-roaming-horse use over time could permanently affect the productivity and function of some areas," they wrote.

The problem is vast, with >81,900 free-roaming horses and burros occupying 31.6 million acres of federal lands—exceeding the Bureau of Land Management's appropriate management level by more than 55,000 animals.

In addition, "domestic livestock grazing often confounds the ecological effects of free-roaming-horse grazing, giving rise to considerable uncertainty regarding the full extent and degree of the impact of horses on rangeland ecological processes." They drew clear distinction between continuous year-around grazing by free-roaming horses and planned grazing by livestock, which is better managed.

Free-roaming horse populations are growing at a mean average rate of 20% per year, and public resistance to horse removal has stymied efforts to address this rise.

The solution the authors pose is rigorous ecological research with an eye toward promoting change to address the far-ranging effects of this charismatic but ecologically imposing species. **MeV**

For more information:

Davies KR, Boyd CS. 2019. Ecological effects of free-roaming horses in North American rangelands. *BioScience* 69: 558–565.
https://doi.org/10.1093/biosci/biz060

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