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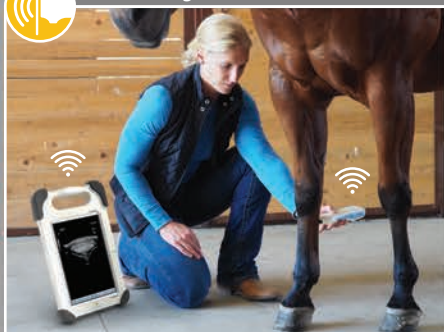


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- > Dealing With Infectious Disease at Horse Shows
- > Does Your Horse Need a Low-Starch Diet?

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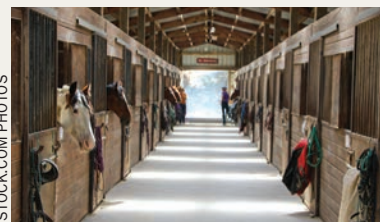
SPECIAL COVERAGE SECTION

COVID-19 Resources for Horse Owners

A War Sans Cavalry: Horse Ownership in the Age of COVID-19

Our international reporter based in France shares her experiences during confinement and seeks clarity on official guidelines for horse care and welfare.

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Horse Owner Help During COVID-19

What to do if you need help feeding your horses after a COVID-19-related job loss, and how to help others if you don't.

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Are Your Horses Ready for You to Be Quarantined?

The current (human) coronavirus situation has one of our team members making sure she has everything she needs to care for her horses in case she can't leave home for two weeks or longer. Are you prepared?

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COVID-19 Equestrian Event Cancellations

The Kentucky Derby has been postponed and Land Rover Kentucky 3-Day Event canceled. Here's a list of equine events canceled due to the COVID-19 pandemic.

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Longeing's Potential Effects on Equine Joints

Brian Nielsen, MS, PhD, of Michigan State University, looks at whether frequent longeing can cause joint damage in horses over time. Do you have performance horse health questions? Send them to editorial@TheHorse.com.

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WEBCAST

Drugs, Devices, and Decisions

Understand your options in managing equine degenerative joint disease (DJD), presented by Marian Graves, DVM.

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VIEWPOINT

STEPHANIE L. CHURCH, Editor-in-Chief
@TH_StephChurch

Conserving Connection



We're all adapting to a striking new reality right now. As horse owners, we've seen the COVID-19 pandemic upend our "normal" when spring recreational and competition riding was just getting started. As humans, we've seen it transform the way we go about our daily lives, being more mindful of friends, family, strangers, the risks we might pose to them, and vice versa.

We're in a time where these changes, while uncomfortable for us, are crucial for halting the outbreak.

Aside from virtual communications with coworkers, family, friends, and my gym buddies, one thing has been vital to my wellness right now: time with my horse, Happy. I spend most of the day looking forward to my permitted 45 minutes with him at the Lexington, Kentucky, farm where I board—even though it means rushing around while taking critical biosecurity steps to keep the barn staff and other boarders healthy. Being around Happy calms and distracts me for a bit. It keeps me grounded.

Indeed, for those of us at *The Horse* who have horses, COVID-19 has impacted us in different ways.

Jennifer is our web producer, and her family's eight Appaloosas and two Quarter Horses live at their farm in nearby Lawrenceburg. For them the impact has been minimal; they've been ordering and picking up feed and supplies from the local mill and providers. She's disappointed her shows have been canceled but acknowledges the found time for farm-related spring cleaning and work.

Michelle, our digital managing editor, keeps her four horses—equal parts trail and dressage mounts—at home, near Bend, Oregon. She

misses taking lessons but says the stay-at-home order has slowed her down and given her more freedom to spend time with her horses, taking extra moments to scratch or groom.

Our managing editor, Alex, also has a time slot where she can ride the Warmblood mare she's leasing at another Lexington barn. Shows, field trips, and group lessons are off the table, and the outbreak means more disinfection-related chores. But she's marveled about how quiet it's been at the barn and how boarders have quickly adapted to communicating and signing up for ride times via a shared messaging app.

My barn family has also been using a messaging app, for logistics, support, and much-needed levity.

We're all grieving the loss of normal right now and, even though it can't be in person, connection is critical. I hope you and yours are healthy and safe and that you're connecting with friends virtually. I also hope you are getting to connect with your horse on the ground or (safely!) in the saddle. Simply talking to Happy as I check on him, graze him, and walk around the farm has done more for our communication than a thousand transitions in the arena.

Please tell us how you're adapting to a COVID-19 horse world. 🐾

the **HORSE**
YOUR GUIDE TO EQUINE HEALTH CARE

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Thank you for your patience during this time. *The Horse* wishes you and your horses good health and safety in the upcoming weeks. We will get through this together!

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The Horse is an all-breed, all-discipline equine education provider for hands-on participants in the horse industry. It will disseminate the latest and most reliable news and information on the health, care, management, and welfare of equids through print and electronic means.

CORRECTION

In the March 2020 issue on page 31, Dr. Dean Richardson's degrees should have been listed as DVM, Dipl. ACVS.

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May 2020

7



Common Equine Eye Conditions

Eye problems in horses are extremely common. Last year alone, our group practice performed 100 eye exams on horses experiencing signs of eye disease or trauma. If you have ever dealt with an equine eye problem, you know the importance of early recognition and appropriate treatment. Here are some common conditions and how your veterinarian might manage them.

To begin an eye exam, your vet will review your horse's medical history. Then he or she will evaluate the horse for comfort and eye symmetry, examine the structures surrounding the eyeball, assess vision and reflexes, apply a fluorescein stain, and examine the back of the inside of the eye using a magnifying lens with a special light source. Certain conditions involve measuring intraocular pressures and dilating the pupil. In all cases treatment goals are to preserve vision, decrease pain, and prevent infection and recurrence.

Horses are particularly vulnerable to ocular trauma because their eyes are large and positioned on the sides of the head.

Corneal ulcers are one of the most common eye conditions caused by trauma. The cornea is a transparent membrane in the front of the eye. Fluorescein stain dye adheres to defects, making them more visible. Corneal pathology (disease or damage) generally results in opacity, and various color changes can accompany this process. Other signs include squinting, eyelid swelling, and discharge.

Corneal ulcer treatment and prognosis depend on the defect's depth. For uncomplicated (small and superficial) ulcers veterinarians might prescribe a topical antibiotic to prevent infection and an oral anti-inflammatory. If the pupil is small (a pain response called miosis), he or she might apply a topical medication such as atropine for dilation. For complicated (infected, deep, large-diameter) ulcers, hospital referral is ideal, because the eye might



Horses are vulnerable to eye trauma because of the size and location of their eyes.

need medication every few hours and close monitoring. If a corneal ulcer fails to respond to medical therapies, is significantly deep, or has a "melting" appearance, vets usually recommend surgery to remove the dead and infected tissue and place a conjunctival graft. If corneal ulcers are treated early and aggressively, the prognosis for vision can be good.

Eyelid lacerations are also common results of trauma. The classic case is an avulsion (tearing) that occurs when the horse "catches" his eyelid on a hook-shaped object (like the "J" on a bucket handle). After examining for concurrent eye damage, the veterinarian usually sedates the horse, administers local anesthesia, prepares the skin, and repairs the laceration. Aftercare typically involves systemic anti-inflammatories and antibiotics. If treated promptly, prognosis is good.

Another common eye issue is **conjunctivitis**. The conjunctiva is the mucous membrane covering the inside of the eyelids and white part of the eye. Clinical signs of conjunctivitis include ocular discharge, redness, and swelling of these

tissues. Causes include allergies and insect hypersensitivity, which can be treated with anti-inflammatories, antihistamines, and environmental modifications.

Uveitis is an inflammatory condition of the middle layer of the eye. Complications associated with uveitis are the No. 1 cause of blindness in horses worldwide. Uveitis is categorized as acute or chronic/recurrent. Vets base their initial diagnosis on clinical signs of squinting, ocular discharge, corneal edema (swelling), blood or pus in the anterior (front) chamber, and miosis, among others. Uveitis is immune-mediated and has multiple causes, both infectious (*Leptospirosis*, *Streptococcus*, equine influenza, and equine herpesvirus, to name a few) and non-infectious (trauma or tumors). Certain breeds, such as Appaloosas, are at higher risk for uveitis. Sometimes a cause isn't apparent, and it must be treated symptomatically. Treatment consists of topical medication to dilate the pupil, topical anti-inflammatories (corticosteroids or non-steroidal anti-inflammatories), topical immunomodulators, and systemic anti-inflammatories. Most horses with the acute form initially respond well to symptomatic treatment, but long-term prognosis might be guarded because of recurrence, and each episode causes further eye damage.

Medical therapies for eye disease can be prolonged and fraught with complications. In cases that cannot be treated for financial or medical reasons, enucleation (removing the eye) can be curative. Study results show that horses can return successfully to a variety of disciplines following enucleation, and owners report satisfaction with the procedure and outcome.

If you suspect an issue with your horse's eye, remember that early detection and veterinary attention will help ensure the best possible outcome. 🐾

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Helping Horses SELF-HEAL

STACEY OKE, DVM, MSC

Regenerative therapy is an umbrella term encompassing any method that encourages the body to self-heal. Because it is drawing on its own properties, healing tissue more closely resembles native tissue than weak, disorganized scar tissue typically seen post-injury.


“The goal is to allow restoration of normal function and structure of the injured tissue to allow horses to perform at their previous level, whatever that might be, with a reduced risk of reinjury,” says Kyla Ortved, DVM, PhD, Dipl. ACVS, ACVSMR, assistant professor of large animal surgery at the University of Pennsylvania’s New Bolton Center, in Kennett Square.

She says the three main components of regenerative medicine that help tissues self-heal include:

1. A scaffold upon which tissues can regenerate;
2. Cells of the specific tissue type in need of repair or cells that help direct repair through signaling; and
3. Bioactive signals/inflammatory mediators that direct the flow of traffic during the repair process.

“A specific therapy may incorporate some or all three of these components,” says Ortved.

Due to the regenerative therapy industry’s popularity and continued growth, many articles we’ve published review recent laboratory studies about stem cell production and data on efficacy and safety (you can find them at TheHorse.com/topics/regenerative-medicine). Here, we’ll review the basics of three regenerative modalities commonly used in equine medicine and when veterinarians and horse owners might consider each.



The art (and existing science)
of regenerative medicine in equine
practice, and what's to come

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Types of Regenerative Therapies

Platelet-rich plasma (PRP) With this approach the practitioner collects blood from a horse and processes it using a commercial system that concentrates the platelets. When he or she injects that concentrated platelet product back into the horse, granules within the platelets release an array of growth factors that aim to facilitate and modulate the healing process. Specifically, granule-derived growth factors encourage target tissue cells at the injury site to migrate and proliferate, improve extracellular matrix synthesis, and stimulate blood vessel development.

Recently, “leukocyte-reduced” PRP has become many equine veterinarians’ PRP product of choice. These preparations contain fewer white blood cells (leukocytes) and, reportedly, inflammatory mediators than normal PRP products do. These mediators break tissues down, effectively counteracting the anabolic (tissue-building) effects of the platelets and their granules.

Autologous conditioned serum (ACS) Veterinarians can easily prepare ACS by collecting a blood sample from the patient, then incubating it with special commercially available glass beads to stimulate interleukin-1 receptor antagonist protein (IRAP) production. They then inject the resultant IRAP-rich serum



COURTESY DARCY ROSE

Tendon, ligament, and joint injuries are among the most frequent targets of regenerative medicine.

sample back into the patient at the target location or injury site. This protein blocks the action of interleukin-1, a powerful and damaging pro-inflammatory mediator. Additionally, glass bead incubation stimulates the production of anti-inflammatory mediators and growth factors similar to those found in PRP.

Ortved says it’s important to remember that all biologics, including PRP and IRAP, contain various concentrations of growth factors and bioactive protein.

“Remember, they are made from your horses’ blood and, therefore, contain all of the components in blood, just in varying concentrations,” she says. Regenerative therapies that contain high

concentrations of IRAP include IRAP II, autologous protein solution (APS), and bone marrow aspirate concentrate (BMAC).

Stem cell therapy (SCT) In certain tissues, such as adipose (fat) and bone marrow, we can find specific cells that have the ability to self-renew and grow more than 200 types of body cells. Veterinarians can isolate these cells, called stem cells or progenitor cells, and either:

1. Immediately concentrate and inject them directly back into the same horse at the target location, or
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ability to differentiate into other cell types, stem cells have “powerful anti-inflammatory properties and play a central role in coordinating healing in all types of tissues through cell-to-cell signaling,” Ortvad says.

Which of these three modality types will provide the most benefit to your horse depends on a variety of factors that you and your veterinarian will consider.

Choosing an Implemment

In a study published in June 2018, surveyed horse owners listed PRP and IRAP as two of the 10 most popular equine rehabilitation modalities available. Some said they also used stem cell therapy, but not as frequently as PRP and IRAP.

“I think the main reason that stem cell use has been dipping in the U.S. is because consistent efficacy has yet to be achieved,” says Ashlee Watts, DVM, Dipl. ACVS, equine orthopedic surgeon and director of Texas A&M University’s Equine Orthopedics and Regenerative Medicine

Lab, in College Station. She says that in some horses stem cells appear to be highly effective. “In others, it’s as if we had done nothing in addition to routine therapy and care,” she adds. “We think this is because some of the methods used to prepare stem cells was rendering them ineffective in most horses.”

Lisa Fortier, DVM, PhD, Dipl. ACVS, James Law professor of equine surgery at Cornell University and a clinician at Cornell Ruffian Equine Specialists, in Ithaca, New York, concurs: “The variability in the product we are delivering ... presently applies to all regenerative therapies: PRP, IRAP, APS, and stem cell products alike.”

Putting aside the conundrum of product optimization for the moment, let’s look at when and how practitioners are using these therapies in horses.

Musculoskeletal Injuries

Tendon, ligament, and joint injuries are among regenerative medicine’s most frequent targets. This is partly because

musculoskeletal conditions can limit a horse’s functionality.

Take, for example, a superficial digital flexor tendon (that runs down the back of the leg from just above the knee or hock to the pastern) core lesion presumably caused by overloading the tissue. This is the most common cause of tendon and ligament injuries in athletic horses, and no one treatment approach has resulted in fast and durable repairs. These injuries typically require months of rest, rehab, and careful return to work—a frustrating and economically draining process that often fails due to the high rate of reinjury.

Because, again, regenerative medicine involves products that mitigate inflammation and stimulate normal, healthy tissue production instead of laying down weak scar tissue prone to future injury, our sources often reach for them when managing soft tissue and joint injuries.

“For tendons, I start with PRP while culturing the horse’s own stem cells, which can take several weeks,” Fortier



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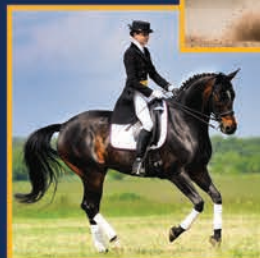
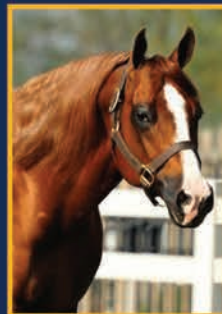
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says. "This way, we are addressing the lesion in the very early phase, before scar tissue starts forming, and we follow up with stem cells."

In the case of suspensory ligament injuries, Fortier reaches straight for a combination of stem cells and extracorporeal shock wave therapy, adding that she's had limited success with PRP- or IRAP-based products for treating these lesions.

Another classic condition for which

regenerative medicine comes to the rescue is osteoarthritis, a painful degenerative joint disease that has no cure. Owners can choose between PRP, ACS, and SCT to help manage their horses' joint pain. Studies support the use of each of these products; however, individual equine veterinarians have their preferences.

"I use leuko-reduced PRP for joints because this approach is supported by the highest level of evidence in people for

mild-to-moderate arthritis," Fortier says.

Watts prefers SCT to PRP or ACS. "At Texas A&M University, we are back to using stem cells in joints," she explains. "With optimized preparation methods we are seeing predictable and sometimes almost miraculous results in joints with osteoarthritis and joints with damage to the articular cartilage.

"What we need is more research to develop the ideal treatment regimens for stem cells, including which cases are the best candidates," she continues. "Currently we are injecting high-motion joints that have failed to respond to corticosteroid injections, or have severe cartilage injury, with autologous (self) stem cells every three weeks for a minimum of three treatments. Whether we need to follow up with repeat stem cell injections after this protocol is not known. We need more research, and we need an FDA-approved stem cell product."

"What is important to remember is that we have choices: PRP, IRAP, and stem cells," says Fortier. "There are no head-to-head comparisons for these therapies in tendon, ligaments, or joints in horses, so opinions will vary between veterinarians depending on their personal experiences."

Further, the exact treatment regimen and associated costs will depend on the severity of the disease and how soon the horse receives treatment.

"If a horse is treated in the first couple



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of weeks of developing a tendinopathy, then only one treatment might be needed,” says Fortier. “Regenerative therapies and rehabilitation need to be applied in the early phase, ideally in the zero- to three-week window after injury, before scar tissue starts to form.”

Other Conditions

Because of regenerative techniques’ proven and perceived effects in horses with musculoskeletal injuries, veterinarians and researchers are exploring their use in other settings, as well. These uses, however, remain quite experimental but might have a great deal to offer, especially for conditions that have, to date, remained resistant to standard medical approaches. Consider some of the following:

- SCT or ACS for modulating persistent mating-induced endometritis (inflammation of the uterine lining).
- SCT for systemic inflammatory conditions such as endotoxemia, equine asthma, inflammatory bowel disease, and uveitis (a type of eye inflammation).

■ SCT for equine metabolic syndrome, which is characterized by obesity, insulin dysregulation, and laminitis.

The rationale behind using stem cells in these settings is to promote damage repair, renew/reverse aging of certain cells, improve tissue and organ structure and function, and promote the use and excretion of metabolites. With immune-mediate diseases, for instance, stem cells could potentially reduce immune cell activation (e.g., with uveitis) and in others modulate inflammation.

What's Next?

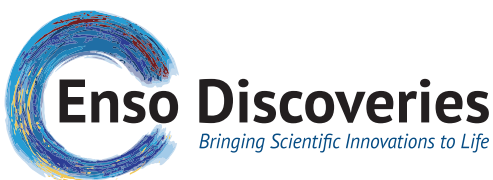
The field of regenerative medicine, although still in its infancy, has exploded since its introduction in the late 1960s. Despite the widespread use of PRP, ACS, and SCT, barriers exist pertaining to their use, including clear-cut instructions on how to prepare and administer them properly.

“I think with optimized preparation methods we will hopefully have an approved SCT for horses in the U.S. soon,” says Watts.

Looking further into the future, Fortier suggests the next type of regenerative product for horses will be a “secretome.”

“Essentially, a secretome would include all the bioactive factors that stem cells secrete to elicit the desired clinical effect,” she says. “This way, we will have a cell-free product that delivers all the benefits that SCT has to offer but will be a consistent product. By FDA regulations, secretome will be a drug and will need to clear all the associated regulatory pathways to become available for use.”

Fortier cautions that “there are no secretome products on the market right now, but plenty of companies are suggesting that their product contains secretome. Owners and veterinarians should be very wary of these products and, in fact, should ask the company for their IND (investigational new drug) number. This number will indicate that the company has some evidence that their product contains secretome and that they have filed with the FDA to be able to investigate the efficacy of their secretome drug in your horse.” 🐾



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The pleasures and pitfalls of
caring for very old horses

Horses OVER 30

STACEY OKE, DVM, MSC

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“**Y**ou can’t help getting older, but you don’t have to get old.” The immortal words of late comedian George Burns might very well apply to our horses. With their elevation in status from work animals to companions, horses’ “average” lifespan has increased dramatically over the past several decades.

“Many horses continue to lead active and productive lives well into their 20s and 30s,” says Jo Ireland, BVMS, PhD, CertAVP(EM), MRCVS, a lecturer in equine practice at the University of Liverpool’s School of Veterinary Science, in Leahurst, U.K. “Albeit rare, reports of horses living to be 50 do exist.

“While some (owners) focus on age in years, others instead assess their horse’s physiologic age and base aging on functionality and the presence or absence of age-related diseases,” she adds.

Burns’ words of wisdom aside, Ireland attests that horses over 15 years are generally classified as old, whereas those 30 and above are very old. In human medicine, a common term for this population is “late elderly.”

The number of horses surviving 30 years or more is, not surprisingly, small. Current estimates suggest that only 2.2% of all horses and ponies in the U.K., for instance, are over 30.

In this article we’ll review the unique needs of very old horses. We’ll also meet five horses beyond 30 with age-related ailments.

Elderly Horses’ Aches and Pains

To understand how to best support seniors, we first need to learn which body systems mostly commonly develop problems. Catherine McGowan, BVSc, MACVSc, Dipl. EIM, ECEIM, FRCVS, professor and director of the equine division at the University of Liverpool, says clinicians collecting case data at referral centers tend to report acute conditions such as colic, whereas veterinarians conducting field-based studies tend to note more chronic conditions.

Results from British and Australian field studies show the leading causes of morbidity (illness) in horses 15 years and older as:

1. Dental abnormalities, including cheek teeth issues, diastemata (gaps between teeth), excessive wear, and focal overgrowths, in 95-96% of examined older horses;
2. Dermatological abnormalities such as hypertrichiosis (long wavy coat/failure to shed), skin tumors, and *Culicoides* (biting midges) hypersensitivity in 40-71%;
3. Ophthalmic lesions such as cataracts, vitreous degeneration, and senile retinopathy in 88-94%;

4. Cardiac abnormalities, including murmurs, in 25-43%;
5. Nasal discharge or breathing abnormalities in 7-22%;
6. Lameness in up to 50%, although up to 80% had hoof abnormalities; and
7. Pituitary pars intermedia dysfunction (PPID) in 21.2%.

In a separate study Ireland performed exams on horses 30-plus years old to identify leading morbidities in this population. She found that:

- 100% of the horses had dental and ocular abnormalities;
- More than three quarters (77%) were lame; and
- Horses experienced an increased prevalence of dermatological, cardiac, and respiratory abnormalities.

Upon comparing the horses in the 15-plus and over-30 groups, Ireland found that only 10% of the very old horses were overweight, versus 26% of the 15-plus. Fifteen percent were underweight, compared to only 4% of the 15-plus horses.

Researchers have shown that owners tend to underreport medical conditions, particularly chronic ones, in their horses. To be fair, many conditions in older horses are difficult to detect without a veterinary exam, particularly dental, ophthalmic, cardiac, and respiratory issues.

Further, in her research McGowan recognized that what owners identify as major medical concerns in older horses does not necessarily match what veterinarians find on their examinations. For example, owners report weight loss/maintaining condition, arthritis and other causes of lameness, and dental care as the most common issues, which only scratch the surface of old horse morbidities.

Now that we know what commonly ails aged equids, let's meet five super-seniors and learn about the issues they face.

Doug: Battling Dental Disease

Indeed, Doug, a gray 32-year-old Appaloosa, does not walk alone when it comes to dental disorders. Neil Townsend, MSc, BVSc, MRCVS, of Three Counties Equine Hospital, in Gloucestershire, U.K., says most of the dental issues we see in about 95% of geriatric horses stem from normal age-related changes. But they can be aggravated by dietary management and even excessive dental treatment early in life.

Doug's recent dental exam revealed



LAURA PALAZZOLO

Things some owners consider to be normal signs of aging, such as this 30-year-old Appaloosa's sway back, might actually indicate an underlying problem that needs to be addressed.

that his incisors don't meet as snugly as they once did, potentially making it more challenging to grasp forage. His canine teeth have a notable amount of calculus (plaque), with a small fracture beginning to form on one. Farther back, his cheek teeth have sharp points. Some are unstable due to lack of reserve crown—this means he's essentially running out of tooth (equine teeth erupt gradually over time but are a finite length).

"During routine dental treatments, those sharp points on cheek teeth must still be removed to avoid traumatizing soft tissues in the horse's oral cavity, and the large array of age-related cheek teeth abnormalities must also be addressed," says Townsend.

Other examples of senior horse cheek teeth abnormalities include smooth mouth (the teeth are worn down to root level), step mouth (overgrowth of the teeth opposite a lost or worn tooth), and shear mouth (the jaws and teeth don't align).

Practitioners managing older mouths like Doug's with multiple problems typically tackle the issues in a stepwise fashion. This means more frequent visits than what younger animals generally need.

"The ultimate goal is to ensure oral comfort and to maximize masticatory (chewing) ability," says Townsend.

Xandria and Xander: Creaky but not Crippled

Is your horse having trouble with his get up and go, no longer loping up to the gate when you deliver supplementary feed and hay? Then it's time to heed actor John Wagner's advice: Don't let aging get you down, it's too hard to get back up.

"In a study of 69 horses 30 years and older, a staggering 77% was found to be lame at clinical examination, and almost 100% of those horses had a reduced range of motion in at least one joint," says Paul René van Weeren, DVM, PhD, Dipl. ECVS, head of the Department of Clinical Sciences in Utrecht University's Faculty of Veterinary Medicine, in the Netherlands.

Musculoskeletal diseases such as chronic joint disorders and the debilitating hoof disease laminitis were the principal reasons cited for euthanasia in approximately one-quarter of these geriatric horses.

Let's take a look at our stately pair Xander and Xandria, pasturemates in their early 30s. Xandria is an off-track Thoroughbred who, like many retired athletes, suffers from osteoarthritis—the painful joint disease characterized by degeneration of the articular cartilage lining the ends of long bones. It often develops as a result of repeated microtrauma to the

joint. Xandria's owner had noticed mild to moderate lameness in both forelimbs when the 33-year-old mare meandered around the paddock. She also observed swelling in the front fetlocks. The vet noted that Xandria's range of motion in those joints decreases with every visit.

Because articular cartilage cannot regenerate, the veterinarian's goal is to keep the mare as comfortable as possible. Van Weeren says this includes a combination of intra-articular therapies, non-steroidal anti-inflammatory drugs, and oral joint health supplements.

"Management strategies falling into the category of 'other,' but not to be viewed as second-class recommendations, include weight management, appropriate shoeing, physiotherapy to optimize joint stability, and controlled exercise that does not reach the point of fatigue," he says.

For Xander, Xandria's 31-year-old Quarter Horse companion, laminitis has been an on-and-off issue for several years. Because Xander has always been on the plump side and has suffered recurrent bouts of mild yet still painful laminitis, his veterinarian tested and confirmed that he has insulin dysregulation, the central feature of equine metabolic syndrome (EMS). Xander's owner altered his diet to encourage weight loss and reduce nonstructural carbohydrate (e.g., concentrates, sweet feeds, lush pasture) intake. She also helped minimize bouts of laminitis (and, therefore, fatal progression of the disease) by ensuring Xander has routine farrier visits and veterinarian-prescribed medications for managing pain and EMS.

"Although chronic OA and laminitis aren't typically viewed as life-threatening disorders, they are certainly disabling and, therefore, have important welfare issues in aged horses," says van Weeren. "The pain present in both cases must be controlled, along with changes in management to keep the musculoskeletal systems as healthy as possible in this generation of horse."

Patrick: Prince of PPID

Patrick, a 36-year-old Arabian cross, did not have the luck of the Irish but instead ended up getting PPID—as many aged Arabians and ponies do. This endocrine disorder affects an estimated 21.2% of horses 15 and older, as compared to

2.9% of the general equine population.

"The reason why many aged ponies and Arabians fall prey is that they tend to live longer, and PPID is well-associated with age," says McGowan. "In a 2013 study I reported that the odds of developing PPID increased by 18% each year from 15 years of age. So by the time a horse is 36, then the luck of the Irish may well run out!"

Advancing age appears to be the main risk factor for PPID, says Ireland, adding that by the time a veterinarian first diagnoses the condition, most horses are around 21 years old.

"The good news for Patrick is that with appropriate treatment, such as oral pergolide medication and routine farriery, he can expect to live for several more years and perhaps up to another decade," Ireland says.

To enjoy those golden years, however, owners must recognize signs of disease in their horses and get a veterinarian's diagnosis.

“In a 2013 study I reported that the odds of developing PPID increased by 18% each year from 15 years of age.”

DR. CATHERINE MCGOWAN

"Failure to recognize important signs of an underlying problem leaves a large number of horses undiagnosed and, therefore, untreated," says McGowan. "Especially signs that were once (erroneously) considered to be normal signs of old age such as swayback (epaxial muscle wastage), a potbelly, and reduced exercise tolerance."

She says owners also tend to overlook another hallmark sign of PPID, hypertrichiosis, because it occurs slowly over time.

Victor: At Risk of Eye Infection

In one study Fernando Malalana, DVM, Dipl. ECEIM, FHEA, MRCVS, senior lecturer at the University of Liverpool, found that ocular abnormalities occur in approximately 94% of horses 15 years

of age or older. The prevalence of ocular disease in horses over 30? 100%. He found, however, that only 3.5% of owners reported concerns regarding their horses' eyes, and only 2.6% perceived eyesight as an important health issue.

This might be, at least partially, because few ocular conditions result in complete blindness. Plus, Malalana says only 5.5% of horses with diminished vision have a reduced menace response (veterinarians check for this by waving a hand while moving it rapidly toward the horse's eye, looking for the horse to blink).

Let's now meet Victor, a 32-year-old Quarter Horse gelding with reduced tear production and mild sinking of his globes (eyeballs) due to orbital fat loss associated with old age. Together, these can negatively affect tear film stability on the surface of the eye and potentially contribute to infection. Recently, Victor also scratched his cornea—the surface of the eye—on the corner of his water bucket, resulting in a red, painful, "hot" eye.

Normally, an ulcer like this heals in about 24 to 72 hours with appropriate veterinary intervention. Luckily for Victor, so did his. If ulcers fail to heal swiftly, however, they can progress to superficial nonhealing ulcers, which can be challenging to treat. They typically require surgical intervention, subpalpebral lavage systems, and extended care in a hospital.

Other eye conditions affecting senior horses include corneal disease (e.g., fluid accumulation/edema, opacities, and scarring); glaucoma, which becomes increasingly common with advancing age; cataracts; degeneration of the vitreous (the liquid filling the globe); and ocular masses such as squamous cell carcinoma.

Take-Home Message

We have a strong bond with and care deeply about the older horses that have been with us for decades. "Yet despite this, some owners can reduce care of our seniors, especially after retirement," says McGowan. "Aged horses require the same, if not higher, level of care as their younger counterparts."

Most older horses suffer from manageable chronic conditions. Providing the necessary care will improve their quality of life for the duration of their golden years. 🐾

Does Your Horse Have

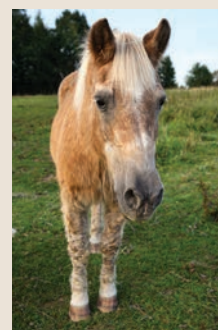
Pituitary pars intermedia dysfunction (PPID, formerly known as equine Cushing's disease) is the most common endocrine disorder of older equids. It affects 20-30% of horses over age 15, though veterinarians have diagnosed it in horses younger than 10. The disease develops when the neurons in the hypothalamus at the base of the brain deteriorate and fail to regulate the pituitary gland's pars intermedia. As a result, the pars intermedia produces excess levels of various hormones that cause the classic clinical signs of PPID shown here.



DELAYED OR LACK OF SEASONAL SHEDDING

LOSS OF MUSCLE MASS/TOPLINE AND A "POT-BELLIED" APPEARANCE

REGIONAL ADIPOSITY (FAT DEPOSITS)



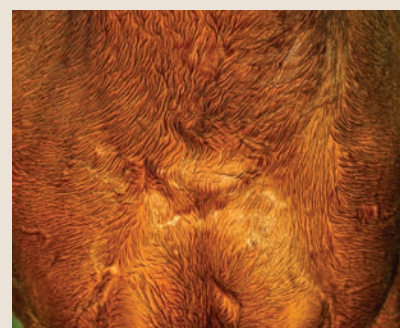
LONG, WAVY/CURLY HAIR



CHRONIC INFECTIONS, INCLUDING SKIN ISSUES AND HOOF ABSCESSSES

RECURRENT LAMINITIS

ABNORMAL SWEATING



LETHARGY OR REDUCED ATHLETIC PERFORMANCE



INCREASED WATER INTAKE AND URINATION

PPID?

TESTING

If you believe your horse might have PPID, your veterinarian might perform one of these tests:

NOTE: Season can influence hormone levels and, therefore, your veterinarian's diagnostic test of choice.

	Resting ACTH (adrenocorticotrophic hormone)	TRH (thyrotropin-releasing hormone) Stimulation Test
INDICATED FOR	Horses with obvious/advanced signs of PPID	Horses with early/potential signs of PPID
HOW IT WORKS	This simple blood test involves measuring ACTH hormone levels in a single blood sample obtained at any time of day. If the values exceed seasonally appropriate normal ranges, then the test is considered positive for PPID. If test results are equivocal (not definitively positive or negative), then the veterinarian might recommend a TRH stimulation test.	In this test, the veterinarian administers TRH intravenously and obtains two blood samples to measure ACTH levels: one just before TRH administration and a second sample exactly 10 minutes after. If the ACTH levels increase excessively following TRH administration, then the test is positive for PPID.

IF YOUR HORSE TESTS POSITIVE

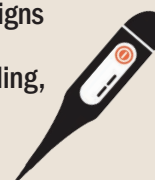
- 1 Work with a veterinarian to formulate a diet that's specific to your horse



- 2 Body clip during warm months



- 3 Watch for signs of infection (fever, swelling, etc.)



- 4 Work with your veterinarian to manage laminitis-associated pain



- 5 Administer daily pergolide, as prescribed by your vet, to control clinical signs



- 6 Have your vet do bloodwork once or twice a year to monitor endocrine values



► **Tip:** Pull out and laminate this spread for easy reference in your barn.

Current options for owners who want to control their mares' heat cycles for breeding or performance reasons

WHAT'S NEW IN ESTRUS MANIPULATION

CHRISTA LESTÉ-LASSERRE, MA

Your mare comes equipped with the signals and structures necessary to reproduce. But nature doesn't always have the most convenient timing.

Like that time all the shipped semen went bad waiting for Ruby to ovulate. Or that embarrassing moment Ellie stopped in the middle of a dressage test and winked her vulva at a flashy Hanoverian stallion. Oh estrus.

All About Estrus

In the five to seven days before ovulating, mares go through estrus, says Christine Aurich, DVM, PhD, head of the Graf Lehndorff Institute for Equine Science, in Neustadt, Germany. During this time, the uterus is preparing to accept a pregnancy, and because semen can live several days inside the mare's reproductive tract, she becomes "ready"—both physiologically and behaviorally—to receive a stallion.

Breeding centers must predict estrus accurately for well-timed mating or insemination, says Aurich. "With the help of induction of estrus and ovulation, breeding processes are much easier and, overall, fertility (conception rate) is much improved," she says.

Likewise, success of assisted reproduction techniques such as intracytoplasmic sperm injection and embryo transfer require careful control of the estrous cycle to eliminate the complication of finding a recipient mare at the right stage of estrus, says Marco Antonio Alvarenga, PhD, of the Department of Animal Reproduction and Veterinary Radiology at Sao Paulo State University, in Botucatu, Brazil.

In performance mares owners might prefer to delay estrus to avoid its undesirable behavior aspects, says Robyn Ellerbrock, DVM, PhD, Dipl. ACT, assistant professor of theriogenology in the University of Georgia's College of Veterinary Medicine, in Athens. "Manipulation is necessary in mares that become difficult to work with when in heat," she says.

SHELLEY PAULSON



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Changing the Hormone Balance

Manipulating estrus is essentially a game of altering hormonal balance to “trick” a mare’s reproductive system into staying longer in a nonestrous phase or to bring on estrus faster and shorten its duration, our sources say.

Delicate balances of primarily progesterone and estrogens induce the various phases of a mare’s estrous cycle, explains Aurich. Estrogen is the predominant hormone during estrus. In diestrus—the period between estrous cycles—progesterone takes the lead. It’s the “pro-gestation” hormone, meaning it promotes pregnancy by encouraging the uterus to accept and hold on to an embryo. Very basically, estrus makes a mare sexually excited, whereas progesterone keeps a mare calm and “maternal.”

Scientists have developed drugs to manipulate estrus, using equine hormones, hormones from other species, and synthetic variations of these hormones. They force a shift in the hormonal balance, changing the estrous cycle.

The reproductive system can also be “encouraged” to alter that balance without drugs, our sources say. By changing aspects of the mare’s environment—including her uterine environment—at different points in the estrous cycle, her body “believes” it needs to be releasing different proportions of hormones than it normally would.

Altrenogest: Still the Gold Standard for Performance Horses

Oral altrenogest (Regu-Mate) is today’s gold standard in estrus manipulation for performance horses in the U.S. and many other countries, says Ellerbrock. “This is the safest (for the mare) and most effective option, with the most predictable outcome,” she says. It’s also the only FDA-approved product for suppressing estrus, she adds.

Altrenogest is a synthetic hormone that shifts the hormone balance to become progesterone-dominant by interacting with the mare’s progesterone receptors, says Callum G. Donnelly, BVSc (Hons I), Dipl. ACT, ACVIM (LA), of the Finno Laboratory in the Department of Population Health and Reproduction at the University of California, Davis, School of Veterinary Medicine. Given orally as a liquid every day during the breeding season, altrenogest generally holds off estrus until about five days after treatment stops.



SUSAN KORDISH/COWGIRL PHOTOGRAPHY

Estrus manipulation is often necessary in mares that become difficult to work with when in heat.

An injectable form reduces contamination risk for drug tests (more on this in a bit) but increases the risks of skin reactions, Ellerbrock says.

A new, though not yet FDA-approved, alternative is a long-term oxytocin injection, which is a “cheaper option that doesn’t risk hormonal exposure for the barn staff,” she explains, potentially interfere with a woman’s reproductive system if absorbed through the skin.

Oxytocin injections, given daily for a week, can cause cramping and don’t work in all mares. When they do, they can prolong diestrus by up to 60 days, says Donnelly.

A Custom Blend for Breeding Stock

Manipulating estrus in breeding mares is a much less straightforward process, because you’re fine-tuning a mare’s individual cycle by working with her unique physiology. “Estrus manipulation should always be performed based on the condition of individual mares,” Aurich says. “The mare has to be examined and the reproductive stage clearly determined before any action is taken. Otherwise, drug administration may be without effect.”

That’s in part due to the mare’s relatively long estrous cycle, she explains. Plus, sometimes ovulation occurs at the end of estrus, sometimes after. So veterinarians must manipulate each mare’s estrus

according to where she is in her cycle.

Depending on that cycle state and the objective of estrus manipulation (synchronizing donor and recipient mares, inducing ovulation for insemination, etc.), veterinarians and owners can treat with various hormones and/or synthetic analogues (lab-made variants), says Alvarenga. Some of these include:

- Prostaglandin F2α (dinoprost tromethamine), a naturally produced compound that regulates hormones.
- Prostaglandin analogues (sodium cloprostenol).
- Progesterone, a naturally produced hormone.
- Progestins, synthetic versions of natural progesterone.
- Estrogens (estrone, estradiol, and estriol), naturally produced hormones.
- Human chorionic gonadotropin (hCG), a hormone produced by placental cells in human embryos.
- Gonadotropin-releasing hormone (GnRH) agonists (deslorelin acetate, histrelin), drugs that target the pituitary glands to regulate hormone release.

Alvarenga says new studies suggest that using prostaglandin, estradiol, and progestins alone, in evolving doses to mimic a natural cycle, can synchronize mares for embryo transfer. However, it only works well in mares that are already cycling and just need adjustments, he adds.

His team has also recently found that combining histrelin or deslorelin acetate with hCG improves success rates in older mares or those at the beginning or end of the breeding season.

GnRH agonists also help induce double ovulation, Alvarenga says, producing two embryos to remove and implant in separate mares to double productivity.

The Anti-GnRH "Vaccine"

One way to control estrus is to render some of the mare's hormones ineffective. That's the principle of the anti-GnRH vaccine. The brain's hypothalamus releases GnRH, signaling the mare's reproductive system to cycle, says Aurich. The anti-GnRH vaccine stimulates the mare's own antibodies to overact in response to GnRH, "killing" its action. The hypothalamus still sends out GnRH, but the reproductive organs no longer respond, and estrus doesn't occur.

"It's very effective," Donnelly says. "But it comes with a huge downside in that mares might never cycle again."

That could explain its lack of FDA approval, he says, though the drug is approved and in circulation in countries across Europe and South America.

While the vaccine might stop cycling, it might not change performance-related issues, says Alvarenga.

Novel Nondrug Therapies

One of the oldest efforts to manipulate estrus involves keeping the barn light on at night to stimulate estrus earlier in the breeding season. Specialized retinal cells in the eyes signal the brain to send messages about time and season to the rest of the body, affecting hormone production. Longer artificial days "trick" the mare's brain into coming into estrus. Irish researchers have found that blue light is more effective than typical fluorescent or incandescent lights because it's abundant in natural daylight. They designed blue-light masks that manipulate estrus more effectively while letting mares get out of the barn and roam on pasture, says Barbara Murphy, PhD, assistant professor in University College Dublin's School of Agriculture and Food Science.

Then there are intrauterine devices (IUDs). For decades vets have used a technique whereby they insert a glass marble into the uterus to mimic



A magnetic IUD is safe and effective in mares.

pregnancy. It works, to an extent, but the marbles can break and damage the reproductive organs, says Donnelly.

A new, safer IUD might soon become available. Carlos Gradil, DVM, PhD, Dipl. ACT, professor in Tufts University's Department of Veterinary and Animal Sciences, in Amherst, Massachusetts, and adjunct associate professor at the school's Cummings School of Veterinary Medicine, in North Grafton, has designed a magnetic IUD. Its three shatterproof beads self-assemble into a ring after insertion into the uterus. Early research showed it extended diestrus by an average of 74 days and stayed in place without complications for the 18-month study period. Gradil's team easily removed the IUD with a magnetic retriever, after which all 29 study mares conceived successfully.

Plant Oils: The New Marbles?

Infusing plant oils into the uterus has shown some promise in delaying estrus, says Ellerbrock. "There's a research publication (from 2011) indicating that intrauterine plant oil infusions (fractionated coconut or peanut oil) can work in up to 90% of mares short-term," she says. "But we don't know the mechanisms of action, short-term side effects, or long-term effects on fertility at this time."

The principle is probably similar to that with marbles, in that the oil mimics gestation, says Donnelly. He's used them "sparingly," cautious of yet-unknown side effects but fairly confident in their efficacy.

More recently, though, in a 2016 study Canadian and Brazilian researchers indicated that these approaches "are not effective at all," says Aurich. Evidence is lacking to show that either marbles or oil suppresses estrus or estrous behavior, she says. If owners notice a difference in their mares, it might be purely a placebo effect.

Risks: Lumps, Doping, and Twins

It's relatively safe to manipulate estrus, our sources say. But it's not risk-free. Hormone injection sites can swell, causing discomfort and lumps. "Steroid hormones have to be suspended in oil, and some mares really react to that," says Donnelly.

As mentioned, for competing mares, it's important that the drugs don't lead to positive doping tests—for them or the horses around them. "This is a big issue in sport horses in the U.S. because of drug residues (in feed buckets, for instance), so we're often asked for estrous management strategies that don't involve detectable prohibited substances like altrenogest," Donnelly explains. Due to its nature as a steroid and also as a neuroactive agent, "there's always a question of whether it's performance-enhancing or if it can make horses quieter," he says.

Altrenogest is approved for mares in United States Equestrian Federation and Fédération Equestre Internationale competitions, provided handlers file a medication form. However, it's a controlled medication in geldings and stallions.

There's also the risk that any therapeutic approach could make a mare's estrous behavior worse, Donnelly explains. "Each mare is different and can have different reactions," he says. Ovariectomies—removal of the ovaries—are a good example. Estrogen production stops, but so does progesterone release. "We sometimes remove ovaries in teaser mares, because then they show estrous behavior all the time," says Donnelly.

Some estrous suppression therapies might have long-term or permanent effects on future fertility, Donnelly says.

Still, there's "no concrete evidence" of long-term effects, says Ellerbrock.

As for breeding mares, speeding up estrus or inducing ovulation can risk the chance of double ovulation, creating twins in a single gestation—which is detrimental to the health of the mare and usually deadly for the foals, Aurich says, if you're not transferring these embryos.

Take-Home Message

Changing your mare's estrous cycle patterns can facilitate your breeding and performance plans. As research advances in this field, your mare can benefit from improved safety and efficacy, all while helping ensure her long-term fertility. 🐾

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Feeding for Performance

Guidelines for fueling the equine athlete



Performance horse diets differ from maintenance diets in the amount of energy, the quality of protein, and the balance of electrolytes required.

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What does it take to win with your horse? A reputable coach, world-class training facilities, and high-tech equipment will all give you an advantage, no doubt. But for your horse to feel and perform at his best, you'll need to start at a more fundamental level and consider what kind of fuel you're pumping into him.

Equine athletes have nutritional needs specific to their discipline, workload, and lifestyle; for optimal performance, you must address them.

"Fundamentally, the difference between the diet of an equine athlete and that of a horse at maintenance lies in the amount of energy, the quality of protein, and the balance of electrolytes required," says Lynn Taylor, PhD, professor of equine science at Centenary University, in Hackettstown, New Jersey, and owner of a private equine nutrition consulting business.

According to the National Research

Council's (NRC) 2007 *Nutrient Requirements of Horses*, the energy, protein, vitamin, and mineral requirements of horses in heavy work can climb to one-and-a-half to two times their maintenance needs.

"Ultimately, the goal of performance horse nutrition is to replenish glycogen (the storage form of glucose, important for energy) levels and to prevent fatigue," says Sarah Upton, PhD, equine nutrition researcher and senior lecturer of equine science at Nottingham Trent University, in England.

Let's take a closer look at the subtleties of performance horse diets.

Energy's Origin

Horses have different means of obtaining the energy they need to excel athletically. "The metabolic pathway used for generating energy varies with exercise intensity and duration, and not all feed calories are created equal," says Taylor.

Essentially, horses derive the bulk of the energy they need for work from glucose (mostly found in carbohydrates) and amino acids, the building blocks of protein. Once digested, the body can turn both glucose and amino acids into adenosine triphosphate (ATP) to be used for energy.

This process of turning food into fuel happens in one of two ways: The first is through aerobic metabolism, a process that uses oxygen to break down carbohydrates, fats, and protein into glucose. The second type is anaerobic metabolism, which produces energy using glucose in the absence of oxygen, a comparatively faster process than aerobic metabolism that grants immediate power. The catch? The energy produced is short-lived and doesn't sustain the horse as long as that produced by aerobic metabolism. Plus, the anaerobic metabolism cycle produces lactic acid, which can accumulate in the muscles, causing fatigue and soreness.

To put these in context, consider two different types of performance horse. Endurance horses rely almost exclusively on aerobic energy synthesis to steadily cruise 50 miles or more, whereas racing Quarter Horses count on anaerobic metabolism to dash the short quarter of a mile between starting gate and finish line. Horses participating in other disciplines use both aerobic and anaerobic metabolism in different proportions, depending on the intensity and duration of their work.

Forage as the Foundation

Horses have evolved over the past 55 million years as herbivores, so forage is the foundation of their diet. They extract energy from forage by fermenting in their hindguts the structural carbohydrates that make up this fibrous feed. Forage is also essential to keeping a horse's digestive tract healthy, as a high-fiber diet (1.5-2% of the horse's body weight daily)

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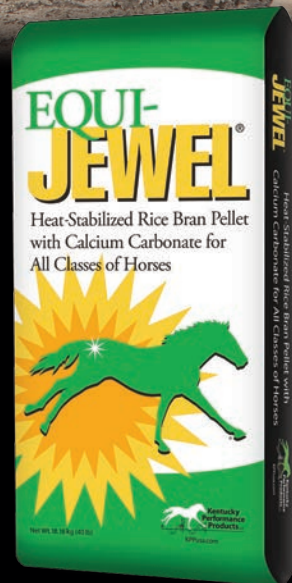
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helps prevent colic (abdominal pain) and gastric ulcers. Ulcers are a pain in the gut for any horse, but especially for athletes, as researchers (Nieto et al., 2009) have shown them to have a negative impact on oxygen consumption, which we know is essential for athletic ability.

Taylor believes owners can pay more attention to providing the best quality forage possible to horses in heavy work. Better quality translates to greater energy extraction, and not all hays are created equal. Plant species matter, with grass hays such as orchardgrass and timothy generally providing fewer nutrients.

Legume hays, on the other hand, are rich in energy and protein; that's why tossing a few flakes of alfalfa into your athlete's stall every day can be a smart addition.

Forage also includes fresh grass. Taylor says eating fiber straight from the source remains the best way to not only cash in on calories but also supply horses valuable fresh air, water, and sunshine.

"Pasture grazing allows movement and provides health benefits such as gastrointestinal motility, musculoskeletal strength, and mental stimulation," she says.

Concentrates: Fuel for Performance

Historical texts suggest that humans were feeding horses concentrates as far back as the fourth century, when Greek philosopher Xenophon added grain to his

war horses' diets to make them run faster for longer—and it worked. While today's sport horses no longer need to charge into battle, they still need energy beyond what forage can provide.

"It is often not possible to meet some athletic horses' calorie demands by feeding only forage," says Taylor. In this scenario she recommends incorporating grains slightly higher in fiber, such as oats, which are easily digestible and contribute to both energy production and digestive health.

Concentrates (cereal grains—oats, corn, barley, etc.—and commercially mixed feeds) are integral to the sport horse's diet, so it's important to understand the role they play. They provide a compact source of energy, intake of which dictates energy available for performance. In other words, you get out what you put in. "Energy" is not a nutrient in itself but a measure of a feed's potential to chemically convert into substances that can fuel the body's physiological processes. Again, the three main nutrients that can be used for digestible energy are carbohydrates, fat, and protein. Let's take a closer look at each.

Carbohydrates Starch and sugar are the two most common nonstructural carbohydrates (NSCs) fed to adult horses. They make up the bulk of corn, oats, barley, and other cereal grains. Once the body absorbs carbohydrate-derived

glucose into the bloodstream, it can use it to either create ATP and consume it as energy immediately or store it intramuscularly as glycogen. When the horse needs that stored energy later, his body turns it back into glucose, a process known as glycogenolysis. Starch and sugar are great energy sources, and it can be tempting to offer them liberally to our equine athletes. However, we must feed NSCs in moderation. While most horses can handle them well (Pagan/KER, 2011), if they consume too much starch or sugar at a time, a complex physiological process that results in hindgut acidosis can cause one of two potentially career- and life-ending conditions: colic and laminitis (a debilitating hoof condition). Additionally, the "sugar rush" associated with glucose intake causes a spike in the hormone insulin, which, if repeated over time can cause metabolic disorders.

Fat Good news: Fat can't cause colic or laminitis. Fat is a rather safe and effective way to provide energy to horses in heavy work. It is extremely calorie-dense, containing 2.25 times more energy-per-weight than carbohydrates. Fat molecules are converted into fatty acids that the horse's body can use as energy or store in adipose (fat) tissue. Upton encourages horse owners to embrace this valuable nutrient, because fat-based feeds make horses less "hot" and excitable than



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starch- or sugar-based feeds do. On a practical level, fat is also cost-effective to feed: Vegetable oil, rice bran, soy hulls, linseed/flaxseed oil, and sunflower seeds are all affordable sources. Horses can digest up to 20% fat in their total diet, but be sure to add it progressively because too much can decrease palatability and might result in loose or oily stool.

Finally, when supplementing a horse's diet with fat, Upton recommends increasing vitamin E intake, as well. "When fats are broken down, they oxidize," she explains. "Oxidation leads to the production and release of free radicals, which can cause cell damage. Vitamin E prevents this from occurring by protecting the cells from oxidative stress."

Bottom line: Fat is an excellent energy source for hard-working horses; just take a few precautions when using it.

Protein Joe Pagan, PhD, published a study in 2012 showing that mature working horses need relatively little protein. A traditional performance diet of hay and grain typically supplies the required amount, especially if alfalfa is part of the package. As mentioned, protein is made up of amino acids, and their quality matters. Those known as essential amino acids are particularly important. A few considerations to keep in mind with protein: Any excess is excreted via the urine as ammonia, a highly irritating gas to respiratory tracts and hooves. A high-protein diet also increases water requirements, which can be particularly problematic for athletes that travel and exercise frequently, putting them at risk of getting dehydrated. Finally, protein breakdown produces internal body heat, adding insult to injury when exercising and competing in hot and humid conditions.

Ration Balancers for Easy Keepers

Not all performance horses and ponies need the extra calories concentrates provide—some work hard and still get fat "on air." These easy keepers can maintain adequate body condition and energy levels on forage alone. However, energy isn't the only ingredient that helps a hard-working horse thrive, and hay alone does not provide all the necessary nutrients required for healthy bodily function. The solution? Ration balancers. These low-calorie pelleted feeds provide a concentrated source of nutrients, including often-overlooked

vitamins and minerals. They're convenient to feed and ensure all dietary needs are met without adding unnecessary calories.

A Note About Supplements

More than half of American horse owners feed at least one oral supplement to their horse, according to market studies, and hundreds are available. Manufacturers claim these products solve all sorts of

"Energy" is not a nutrient in itself but a measure of a feed's potential to chemically convert into substances that can fuel the body's physiological processes.

problems but, before potentially tipping the balance of your horse's ration with a supplement, Upton and Taylor recommend consulting an equine nutritionist for advice. Many manufacturers claim their products have performance-enhancing effects, but few have produced supporting scientific evidence, and some products even contain substances prohibited in racing and sport horse disciplines.

Nutritional supplements are designed to compensate for nutrient deficiencies in the diet. But how do you know what, if anything, is missing? Add the nutritional content of the forage portion (that includes estimating what the horse gets from pasture) to that of the concentrate portion of your horse's diet, and compare the total numbers with what the NRC recommends as his nutrient needs. You must have your hay tested, while nutrient information is readily available on the labels of commercial feeds. When feeding performance horses, you might need to supplement with electrolytes at times. While good-quality hay and a salt block provide plenty in most cases, horses exercising in extremely hot and humid conditions can lose enough electrolytes through sweat that they need potassium and sodium chloride supplementation.

Final Words of Advice

In managing your performance horse's diet, Upton and Taylor emphasize the importance of monitoring signs of progress. Your best resources are your vet and nutritionist, and either can show you how to estimate your horse's weight and body condition score. Log these values monthly to evaluate changes over time. And when designing your athlete's ration, consider how to effectively and safely give him the energy he needs to perform at his best. 🐾

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Footing Facts

How the surfaces we ride on affect our horses' soundness



Top show jumper Kent Farrington, pictured here aboard Gazelle, believes that working on different footing types helps prevent injuries.

In tedious rush-hour traffic one October evening in Paris, American show jumper and Olympic silver medalist Kent Farrington, dressed in a black suit and tie, spoke with me about footing. Uceko, he said in his relaxed Chicago accent, likes “big grassy fields.” The 2017 Longines Fédération Equestre Internationale (FEI) World’s Best Jumping Rider, on his way to claim his award at the Hotel de Ville, explained how it’s important to know your horse and his footing preferences.

At home in Wellington, Florida, Farrington has two sand arenas, one grass field, and a dirt track. He trains his horses on all four, as well as on trails. The idea, he said, is to encourage good mental health by changing up the environments. But equally important, he added, is promoting good musculoskeletal health.

In his experience, he said, “varying footing helps prevent injuries,” noting he’d read recent scientific studies to support this. “So in addition to keeping their

minds fresh, alternating the workplace makes horses stronger and improves the health of their ligaments and feet.”

Farrington puts this knowledge into practice—with good results. His horses Uceko and Gazelle, for instance, have remained sound and competing in five-star events well into their mid- to late teens.

Still, there’s a lot scientists don’t know about footing and its connection to lameness and other health issues. Equestrians, event organizers, barn managers, and even researchers don’t always agree on which footing is best in which situations, and why. Whether it’s hard sand, soft sand, dirt, mud, turf (grass), synthetic mixes, concrete, or asphalt, each footing has its own variants.

The Limb-to-Surface Dynamic

To understand the effects of footing on equine locomotor systems, it’s important to visualize what happens when the hoof hits the ground. Think of it as a collision

of different force types in various directions and intensities that evolve throughout the milliseconds the hoof is in contact with the surface. The hoof and the footing are constantly moving and reacting to each other’s forces until the foot becomes airborne again, says Nathalie Crevier-Denoix, DVM, PhD, Dipl. ACVSMR, of the Equine Biomechanics and Musculoskeletal Pathology department of the Ecole Nationale Vétérinaire d’Alfort (ENVA), in France.

Using a force-measuring shoe on a moving horse, combined with 1,000-frame-per-second video recordings, Crevier-Denoix and her team have analyzed in detail how hooves and surfaces react during the “stance” phase of a stride (when the foot is in contact with the ground). Their work reveals the multiple forces exerted in many directions, the vibration of the foot, speeds, acceleration and deceleration rates, and every angle of every structure within the leg and foot—joints, tendons, ligaments, etc.—at any precise instant of the stance. With wireless technology they’re collecting this data for each of the four feet during all gaits, in straight lines and while turning and jumping.

Dynamics vary between disciplines, horses, gaits, and even feet within the same movement, she says. For example, they noted a distinct difference in the foot-surface interaction between the leading and trailing forelimbs during canter and jumping. In jumping the trailing limb lands first and experiences the highest forces, which are vertical. The leading limb lands next and withstands lower forces, but it comes into the surface “progressively” and at an oblique angle—putting it at greater risk of injury, especially if the footing doesn’t cushion the blow appropriately.

“Is the footing deforming?” Crevier-Denoix asks. “If not, the foot is.”

Surface Semantics

"We can't really move forward with understanding the effects of footing on horses' biomechanics and health until we can first agree on how we're describing the footing," says Lars Roepstorff, DVM, PhD, professor of equine functional anatomy at the Swedish University of Agricultural Sciences, in Uppsala.

So, one scientific objective is simply getting people to "speak the same language" when they're characterizing surfaces, he says.

While Crevier-Denoix's shoe is an invaluable tool in understanding how a horse reacts to a surface, it's not one that can be used as a global standard because it would require using the same horse, Roepstorff says. A machine developed by Mick Peterson, MS, PhD, executive director of the Racing Surfaces Testing Laboratory and professor of biosystems and agricultural engineering at the University of Kentucky, in Lexington, on the other hand, drops weight into surfaces to mimic the loads and speed of a moving horse. While the method doesn't use an equine limb, it applies the same force and movement to the footing every time to allow for standardized verifications, he says.

The goal is to provide riders with comprehensible and comparable descriptions of surfaces, says Roepstorff. "It's not to say if the surface is 'good' or 'bad' but to rate various aspects on a scale so people can learn to associate that rating with what they feel," he says. "But that has to start with a more universal language."

“There's not even a consensus yet on what 'soft' and 'hard' mean.”

DR. NATHALIE CREVIER-DENOIX

That language includes terms such as cushion, firmness, grip, responsiveness, and consistency. Currently, though, there's "not even a consensus yet on what 'soft' and 'hard' mean," Crevier-Denoix says. Objective measurement should help, she adds, but if it's going to provide reliable information about injury risks, the tool needs to reproduce the movement and timing of a horse foot.

The Sweet Spot

Although not officially defined, the terms hard and soft footing basically

indicate whether the ground deforms and to what degree, Crevier-Denoix says.

Hard surfaces, including dry dirt and pavement, are associated with lower limb lesions, including in the pastern, fetlock, and coffin joints, in clinical cases, says Jean-Marie Denoix, DVM, PhD, director of ENVA's Centre d'Imagerie et de Recherche sur les Affections Locomotrices Equines. If these surfaces are irregular and hard (e.g., frozen pastures in winter), resulting in uneven foot placement and torque on the lower leg bones, the injuries are worse.

Crevier-Denoix's research also reveals "obvious" correlations between hard surfaces and superficial digital flexor tendon (SDFT) injury risk, she says. She found that Standardbreds trained on hard sand were far more likely to have early signs of SDFT and fetlock damage visible during image-based screening within four months than those training on soft sand (TheHorse.com/158926).

Meanwhile, in horses jumping on a sand-fiber-mix footing, she noted increased impact shock and vertical loading rate on limbs—increasing injury risk—when the softer top layer was only 7 cm thick compared to a cushier 13 or 20 cm. "If you try to cut costs with a thinner top layer, you're just going to end up with more lameness," she says.

Hard surfaces are even more problematic with repetitive training, long rides over extended distances, and/or frequent circling, says Denoix. "Riding club horses experience more trauma to the lower joints when they're constantly turning in circles in hard-surface arenas," he says.

Endurance horses face similar risks because of distance traveled. "They're covering 100 kilometers (62 miles) or more, so if the ground is hard, this isn't going to be ideal for their joints, and (they) could even develop 'road founder,' a form of laminitis," he says.

However, the occasional cross-country run on firm ground is less likely to be a risk factor for joint injury because the distance is shorter and the number of jumps doesn't compare to the "repetition of strides" experienced in disciplines such as endurance, he adds.

Risks can multiply due to the nature of a hard surface, says Crevier-Denoix. Firm footing provides better push-off, making horses move faster. This creates a "double penalty" because higher speeds are, themselves, a risk factor for injury, she says.

Riders need not avoid hard surfaces

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altogether, however. Horses can adapt to working on roads (e.g., police horse patrols, road hacks, etc.) without significant injury risk, provided they start slowly and increase work gradually, says Roepstorff.

Hard surfaces can even be beneficial in some scenarios, such as during tendon healing. “When they’re already healing well, after about four months or so, short trotting sessions of just a few minutes at a time on hard ground can help promote remodeling,” if done under a veterinarian’s guidance, says Crevier-Denoix.

On the flip side, a surface that’s too soft can create issues for the tendons, says Denoix. “Again, we see issues with riding club horses, this time the ones working continuously in soft or deep sand arenas where their tendons are constantly solicited, predisposing them to digital flexor tendinitis (of either the deep or superficial digital flexor tendon) or suspensory (ligament, which lies beneath the tendons) disease,” he says.

The fetlock stays extended for long

periods when the ground is too soft, Crevier-Denoix says. This slows the horse down, which reduces speed-related injury risks but can, again, predispose him to soft tissue injury. Notably, horses with a history of tendon injury should avoid very soft footing, she says. Ideally, they should work on “soft but firm” surfaces.

“Hardness is especially detrimental in sport horses, as short turns induce rotational stresses on distal (lower) joints.”

DR. JEAN-MARIE DENOIX

In areas such as stalls and walkways, footing has little bearing on soundness, provided it’s deep enough to allow horses to avoid twisting their fetlocks—which

are hinge joints and don’t pivot—when getting up and lying down, says Roepstorff. “The intensity is low since they’re mostly just standing, and the horses’ bodies usually adjust well,” he says.

Moisture: A Delicate Balance

Water can be troublesome for all sorts of surface types, our sources say. Too much or too little can create significant footing issues that can lead to lameness.

“If you don’t water your arena it gets too deep and soft and, by contrast, if you water it too much, it gets too firm and compact and even becomes hard,” Denoix says. “Hardness is especially detrimental in sport horses, as short turns induce rotational stresses on distal (lower) joints.”

Think about walking on a sandy beach, says Crevier-Denoix. “The closer to the water you get, the harder the sand gets,” she says. “Where there’s no water at all, it’s so soft and deep it’s hard to walk, but at the water’s limit it’s very hard. Your best footing is where it’s firm but still a little soft.”

Synthetic footing isn’t as likely to harden due to moisture, says Peterson. But it’s still at risk of flooding if drainage isn’t ideal.

Water in footing can also freeze, making an entire surface hard, he adds. Worse, when weather cycles between above and below freezing daily, horses’ hooves can make imprints in soft footing that later freeze. “This creates serious inconsistencies in the footing, in addition to being hard, making it doubly dangerous,” Peterson says.

Consistency Is King

No matter what footing material you use, keeping your horse injury-free requires consistency across that material, our sources say. The various qualities—cushion, firmness, responsiveness, grip—must be the same across the entire surface where the horse will be working.

“When you change the properties under the horse’s feet, you’re putting that horse at risk,” says Peterson.

That’s because the horse adapts to the surface he’s working on; a sudden change can result in inappropriate forces—such as striking the ground too hard, says Crevier-Denoix. “A good example is a dirt surface where suddenly the horse runs into slippery mud, and he slides,” she says.

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References: 1. Zimeta™ (dipyrone injection). [Full Prescribing Information], Kindred Biosciences, Inc. (Burlingame, CA). Revised: 03/2019. 2. Morressey PR, et al. Randomized blinded controlled trial of dipyrone as a treatment for pyrexia in horses. *Am J Vet Res*. 2019;80(3):294-299.

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Not for use in humans. Keep this and all drugs out of reach of children. In case of accidental exposure, contact a physician immediately. Direct contact with the skin should be avoided. If contact occurs, the skin should be washed immediately with soap and water. As with all injectable drugs causing profound physiological effects, routine precautions should be employed by practitioners when handling and using loaded syringes to prevent accidental self-injection.

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As a class, NSAIDs may be associated with platelet dysfunction and coagulopathy. Zimeta has been shown to cause prolongation of coagulation parameters in horses. Therefore, horses on Zimeta should be monitored for clinical signs of coagulopathy. Caution should be used in horses at risk for hemorrhage.

As a class, NSAIDs may be associated with gastrointestinal, renal, and hepatic toxicity. Sensitivity to drug-associated adverse events varies with the individual patient. Consider stopping therapy if adverse reactions, such as prolonged inappetence or abnormal feces, could be attributed to gastrointestinal toxicity. Patients at greatest risk for adverse events are those that are dehydrated, on diuretic therapy, or those with existing renal, cardiovascular, and/or hepatic dysfunction. Concurrent administration of potentially nephrotoxic drugs should be carefully approached or avoided. Since many NSAIDs possess the potential to produce gastrointestinal ulcerations and/or gastrointestinal perforation, concomitant use of Zimeta with other anti-inflammatory drugs, such as NSAIDs or corticosteroids, should be avoided. The influence of concomitant drugs that may inhibit the metabolism of Zimeta has not been evaluated. Drug compatibility should be monitored in patients requiring adjunctive therapy.

The safe use of Zimeta in horses less than three years of age, horses used for breeding, or in pregnant or lactating mares has not been evaluated. Consider appropriate washout times when switching from one NSAID to another NSAID or a corticosteroid.

Adverse Reactions: Adverse reactions reported in a controlled field study of 138 horses of various breeds, ranging in age from 1 to 32 years of age, treated with Zimeta (n=107) or control product (n=31) are summarized in Table 1. The control product was a vehicle control (solution minus

dipyrone) with additional ingredients added to maintain masking during administration.

Table 1: Adverse Reactions Reported During the Field Study with Zimeta

Adverse Reaction	Zimeta™ (dipyrone injection) (N=107)	Control Product (N=31)
Elevated Serum Sorbitol Dehydrogenase (SDH)	5 (5%)	5 (16%)
Hypoalbuminemia	3 (3%)	1 (3%)
Gastric Ulcers	2 (2%)	0 (0%)
Hyperemic Mucosa Right Dorsal Colon	1 (1%)	0 (0%)
Prolonged Activated Partial Thromboplastin Time (APTT)	1 (1%)	0 (0%)
Elevated Creatinine	1 (1%)	0 (0%)
Injection Site Reaction	1 (1%)	0 (0%)
Anorexia	1 (1%)	1 (3%)

See Product Insert for complete Adverse Reaction information.

Information for Owners or Person Treating Horse: A Client Information Sheet should be provided to the person treating the horse. Treatment administrators and caretakers should be aware of the potential for adverse reactions and the clinical signs associated with NSAID intolerance. Adverse reactions may include colic, diarrhea, and decreased appetite. Serious adverse reactions can occur without warning and, in some situations, result in death. Clients should be advised to discontinue NSAID therapy and contact their veterinarian immediately if any signs of intolerance are observed.

Effectiveness: The effectiveness phase was a randomized, masked, controlled, multicenter, field study conducted to evaluate the effectiveness of Zimeta™ (dipyrone injection) administered intravenously at 30 mg/kg bodyweight in horses over one year of age with naturally occurring fevers. Enrolled horses had a rectal temperature $\geq 102.0^{\circ}\text{F}$. A horse was considered a treatment success if 6 hours following a single dose of study drug administration the rectal temperature decreased $\geq 2.0^{\circ}\text{F}$ from hour 0, or the temperature decreased to normal ($\leq 101.0^{\circ}\text{F}$).

One hundred and thirty-eight horses received treatment (104 Zimeta and 34 control product) and 137 horses (103 Zimeta and 34 control product) were included in the statistical analysis for effectiveness. At 6 hours post-treatment, the success rate was 74.8% (77/103) of Zimeta treated horses and 20.6% (7/34) of control horses. The results of the field study demonstrate that Zimeta administered at 30 mg/kg intravenously was effective for the control of pyrexia 6 hours following treatment administration.

Refer to the Product Insert for complete Effectiveness information.

Storage Information: Store at Controlled Room Temperature 20°C and 25°C (68°F and 77°F); with excursions permitted between 15°C and 30°C (59°F and 86°F). Protect from light. Multi-dose vial. Use within 30 days of first puncture.

How Supplied: Zimeta is available as a 500mg/mL solution in a 100mL, multi-dose vial.

Approved by FDA under NADA # 141-513 NDC 86078-245-01

Manufactured for:
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1555 Bayshore Hwy, Suite 200,
Burlingame, CA 94010

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STEP BY STEP

example, by different drying times after rainfall, especially if parts of a surface are shaded—can cause areas to have inconsistent firmness or grip, Peterson says.

Maintenance Musts

The solution to moisture and inconsistency is fairly simple: Maintain the surface. “Harrowing and rolling can make a huge difference in both water content and consistency,” Peterson says. Rolling can “block out” incoming rain, and harrowing can open the surface to help it dry out evenly. “Maintenance makes a huge difference in injury risk,” he adds.

In her study on sand-fiber mix footing, Crevier-Denoix found that rolling created landing forces and angles that put jumping horses at greater risk of injury compared to harrowing, she says. But even a harrowed arena can lose its benefits if it gets compacted from frequent use.

This compacting caused by treading hooves doesn’t just happen when training at home, it happens in competition, too. “Think about show jumping,” Peterson says. “These horses follow the same path and compact that surface with each stride and jump. There’s going to be a competitive advantage for earlier horses, but there are also going to be more animal welfare and soundness issues for the later horses hitting that more compacted footing.”

Consistent, With Variation

You want your footing consistent across a training surface, but for optimum orthopedic health you want to switch up the surfaces on which you train. Horses can adapt to these surfaces, provided they have the chance to do so gradually, our sources say.

“It’s important to habituate horses to different surfaces, from very soft to relatively firm, so that his bones and muscle coordination can adapt and the stresses on tendon are better adjusted by the nervous system,” says Denoix.

A gradual buildup—starting with slow gaits for 10 to 15 minutes at a time—on new surfaces allow the horse’s musculoskeletal system to adjust, Roepstorff says.

The body adapts by sustaining microscopic damage to bone—in particular, subchondral bone, which lies beneath and supports joint surface cartilage—and then remodeling. But taking it slowly is critical. Fatigue fractures and other lesions occur

when the remodeling process can’t keep up with the rate of damage.

Roepstorff says one of his favorite surface-related training methods is “road work on tarmac or hard gravel, by working up gradually in intensity and amount. It’s a very good example of understanding that there are no poor surfaces, only poor use of surfaces.”

Know Your Horse and Your Surface

If there is an “ideal” surface, says Roepstorff, it’s a very broad category of surfaces due to the many factors at play.

One of the main factors is your horse, he says. Depending on his conformation, discipline, genetics, prior health issues, and personal preferences, your horse will probably work better and have less risk of injury on certain surfaces than others.

To determine what that surface is, know your horse and surfaces in general. “Read up on the properties, biomechanics, and characteristics of the different kinds of surfaces,” Roepstorff says. “Get familiar with terminology and textures, and know how these surfaces feel.”

That doesn’t mean going out and stomping around the arena—although you could, says Roepstorff. “The best way is to ... listen to your horse,” he says. “Do you feel him changing his gait or his willingness to move? Consider how he acts on different surfaces, and keep in mind that this could always relate back to injury or soreness.” If you notice different behavior on a new surface, give him time to adapt.

Roepstorff’s team developed a thorough, easy-to-follow, science-based footing guide that riders can download from the FEI at bit.ly/3doVXIit. “It’s a great way to understand how complex the horse-footing dynamic is and how it can affect the biomechanics—and, therefore, the soundness—of the horse,” he says.

Take-Home Message

The footing beneath your horse’s feet affects his overall soundness. As studies on surfaces continue, we’re finding that the horse/ground dynamic is extremely complex, and there is no perfect surface for all situations. Likewise, as long as it’s well-maintained and consistent, there’s no terrible one for all situations, either. The best riders can do today is know their horses and their surfaces and make sound decisions about riding on them. 🐾

The (Nearly) Fly-Free Farm

Techniques to help reduce and manage nuisance fly numbers on horse properties

It's almost summertime. During barn chores we pause in the sun, satisfied just to watch our horses graze peacefully in the green grass. What could be better? Well, there is the fly situation; they're everywhere, buzzing around our faces and pestering the horses, which are constantly shaking their heads, swishing tails, and stomping feet.

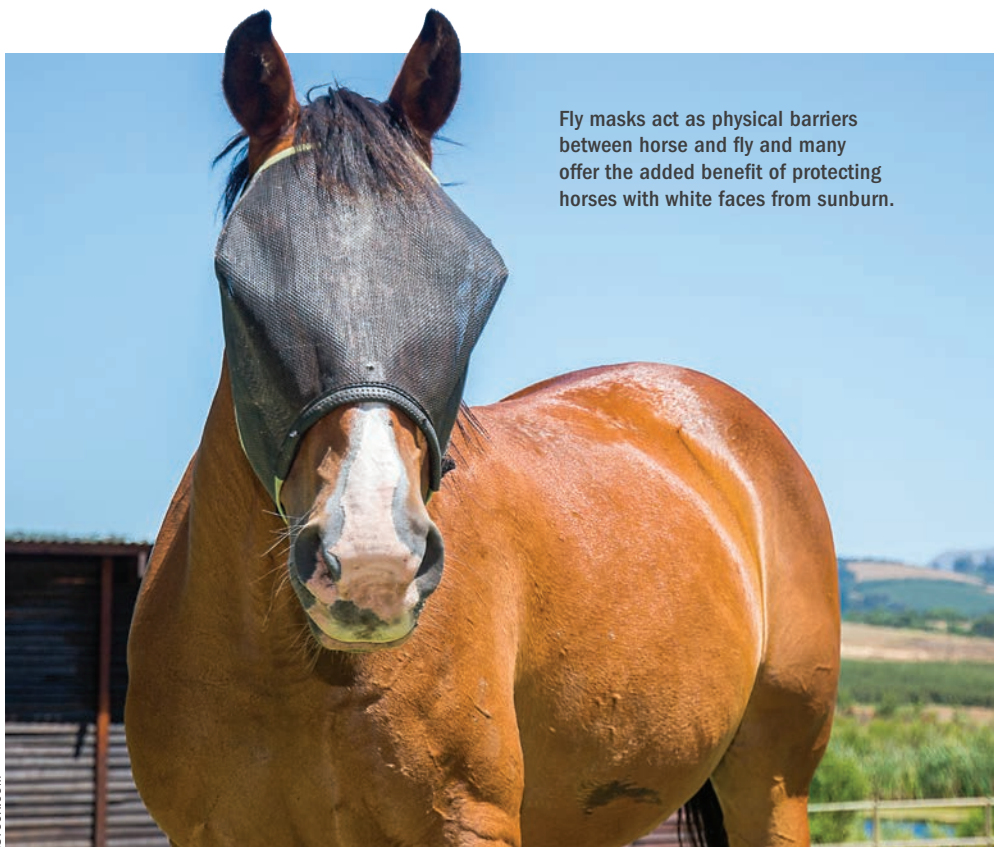
Flies on farms and ranches can be extremely annoying for all who encounter them. While it's not possible to create an entirely fly-free environment, you can take steps to help reduce and manage their numbers.

"Flies are in the order *Diptera*, a very large order which contains several thousand fly species that anyone with livestock deals with constantly," says Brad Stokes, MS, an extension educator entomologist with the University of Idaho, in Mountain Home.

A fly life cycle has four stages: egg, larvae, pupae, adult. "The hardest life stage to control is adult, because they move so quickly and are able to avoid us and our typical control methods," says Stokes. "The best life stage to target is actually larval. All fly larvae require moist organic matter for development," which is often in abundance on horse and livestock properties.

"For controlling insects there are cultural methods (cleaning up manure), mechanical methods (fly swatters, masks, sheets, and tape), biological controls (using organisms that are natural enemies of the pest), and chemical controls," says Paul Castroville, PhD, Idaho State Department of Agriculture entomologist, who has been studying insects for 60 years. "None are 100% effective."

In this article we'll describe a variety of fly control methods targeting different life stages.



Fly masks act as physical barriers between horse and fly and many offer the added benefit of protecting horses with white faces from sunburn.

Manure Management

Your first line of defense against flies should be a fastidious manure management program. Flies are attracted to manure, and larvae eat it; the less manure available, the fewer adult flies attracted, eggs laid, and resulting larvae hatched. So, your first and best control method is daily cleaning of stalls, paddocks, and confinement areas, particularly in the morning before adult flies warm up and begin looking for egg-laying sites.

Then, either remove the stall waste from your property, taking it to a disposal site (TheHorse.com/135757), or compost it at home (TheHorse.com/135463). Researchers have shown that flies and odors are associated with fresh manure and not

with well-managed composting systems. Also clean up other organics, such as spilled feed or grain, grass clippings, decomposing hay, and pet waste, as these are also likely fly habitats.

Make sure stalls and barns have good drainage to eliminate wet/moist areas where flies like to lay eggs. Check gutters and downspouts on farm buildings to be sure they are diverting rainwater away from the structures and surrounding paddocks. Fix leaky faucets, and get rid of anything that collects water, such as old tires, stacks of flowerpots, or barrels.

Harrow (or drag) pastures regularly to break up manure piles. Harrowing spreads and dries out manure, making it less attractive to flies. It also makes

nutrients and organic materials more available for plant use.

Larvicides

Chemical larvicide feed-through fly control products also control flies at their source: manure. These products typically come in alfalfa-based pellet form and can be fed to horses top-dressed on their grain or supplements. For best results, feed these products at the beginning of your fly season, and continue through the fall freeze to reduce fly activity.

Feed-through larvicides “seem like a viable control,” says Stokes. “The two main active ingredients, diflubenzuron and cyromazine, are IGRs, insect growth regulators, which inhibit and disrupt molting while the flies are in the larval growth stage.”

Researchers have shown these products are safe for horses and other mammals (including humans) because molting is a process only insects do. However, if you compost you might not want this



Hang water-and-attractant-filled traps where they'll draw flies away from your barn and horses.

chemical to end up in your bin, because IGRs can potentially disrupt other non-targeted beneficial insects in compost.

Fly Tape

For controlling adult flies, “good old fly tape is probably one of the best options,” says Castrovillo. Consider hanging several strips up high in your barn—as many as

20 to 30 do an excellent job of catching flies and reducing numbers immediately, he says.

“Some flies are attracted to light, but, conversely, there are probably species that are attracted to darker areas,” Castrovillo explains.

Therefore, try placing tape in different areas, such as above doorways or in aisles, in the feed room, and/or up high over the stalls, to see what works best for your situation. Remove old ones and rehang new ones frequently during peak seasons. Choose locations carefully

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Sticky fly traps are often brightly colored and scented to attract flies.

so human hair or swishing horse tails are unlikely to come into contact with the sticky surfaces.

Fly Traps

Fly bags are another successful mechanical measure for trapping adult flies. These pesticide-free traps are literally bags filled with water and a stinky attractant. Flies are enticed by the scent and fly into the bag, can't escape, and eventually drown. Hang fly bags to draw flies away from your barn and horses. Bags come ready to hang and are easy to dispose of (simply throw them in the trash) when full of flies. Reusable varieties are also available if you wish to reduce plastic use. The downside to these traps is they are quite smelly—another good reason to locate them far from barn areas.

Other kinds of fly traps include sticky tubes, which are brightly colored (to attract flies) and might or might not use an attractant. You can hang these up high, out of horses' reach, in stalls or elsewhere in the barn, replacing them with new ones when the old are full.

Barrier Methods

While barrier methods such as fly masks and sheets won't reduce fly numbers, they will provide your horses some relief. Fly masks act as physical barriers between horses and flies, and many offer the added benefit of protecting horses with white faces from the sun. Some masks protect the eyes, while others also protect ears and nose.

Fly sheets are open-weave lightweight mesh blankets that can help keep pesky flies off a horse's body. Fly boots are also available to protect the horse's legs.

Biological Controls

Encourage insect-eating birds to nest on your farm to help reduce the adult fly population. Members of the swallow family can be tremendous assets to horse facilities. An adult barn swallow consumes close to a thousand insects per day, which is comparable to a bug zapper's capability and safer than pesticides. Common North American insect-eating birds include violet-green swallows, tree swallows, barn swallows, bluebirds, purple martins, and cliff swallows, to name a few. Encourage nesting by putting up nest boxes specific to the bird species. For help determining



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the insect-eating birds that live in your part of the country and their nest box needs, consult your local Audubon Society, wild bird store, birding organization, extension office, or library.

Stokes also recommends parasitic wasps as a biological fly control. Parasitic wasps are very small, stingless wasps that lay their eggs in fly pupae. When parasitic wasp eggs hatch, their larvae feed on developing fly pupae, eventually killing them.

For good control, begin releasing wasps early in the fly season, and continue to do so each month throughout summer to build up the parasitoid population. The most commonly released fly parasitoid species, says Stokes, is *Muscidifurax raptorellus*. It can be “very effective as a biological control option,” he says. “It is quite efficient at locating and parasitizing fly pupae, helping to reduce the overall nuisance population over time.”



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Only use fly repellent products that are recommended for horses.

Fly Sprays

There are many types of fly sprays with different modes of action. An insecticide is a chemical that kills insects,

while a repellent is a substance that discourages them from landing. When using insecticides, read and follow label directions carefully, and avoid using

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more than necessary. Only use products recommended for use on horses. Insecticides are meant to be used in open, well-ventilated places. Try not to spray them outdoors, however, because they might kill beneficial insects you haven't intended to target.

"When you reach for the pesticides, if possible, try to use more than one type of pesticide, choosing ones that work in different ways," says Castrovillo. "If you do this, then pesticide A may get what B doesn't."

And remember that continual use of one type of pesticide might promote fly resistance to it or similar pesticides, and indiscriminate use of insecticides might kill beneficial insects or harm birds and bats.

Most equine fly sprays are repellents, which are available as sprays, lotions, wipe-ons, gels, dusting powders, ointments, roll-ons, shampoos, and towelettes.

Repellents contain substances irritating to flies, such as oil of citronella, and many contain some amount of insecticide. They also contain a base product, most commonly water, oil, or alcohol, that helps hold active ingredients to the horse's body hair. Oil-based repellents remain on the horse's hair shaft longer but attract dirt. Water-based repellents don't last as long but attract less dirt. Alcohol-based repellents can be drying to the horse's skin. To extend their effect, some repellents contain silicone, which coats the hair shaft and holds the repellent in place.

Repellents can also contain sunscreen, coat conditioners (lanolin, aloe vera), and other products that might cause them to stick around longer. How long a repellent lasts depends on the weather, exercise level of the horse (how much they sweat), grooming, rolling, and other factors.

A residual premise spray (an insecticide) can knock a huge fly population down without dousing horses in insecticides. The downside of a premise spray is that it can kill any bug that encounters its residue, including parasitic wasps or other beneficials.

Take-Home Message

The bottom line is that we will never completely get rid of all flies, which is a

good thing: Flies are part of any healthy ecosystem. "There are a bunch of fly species whose larvae eat living plants," says Castrovillo. "Other (species of fly) larvae are parasitic on slugs, snails, and caterpillars." And some flies are important plant and flower pollinators.

So, when you pause during barn chores to reflect on that pretty picture of your

horses grazing, don't end it there. Keep that image as fly-free as possible by placing fly bag traps around the property perimeter, hanging fly tape in stalls, releasing parasitic wasps, and adding nesting boxes for insect-loving birds. Help your horses out by equipping them with fly masks and sheets, then use fly spray only as needed. 🐾



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

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

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