EQUINE AMBULATORY NEWS

Volume 13: Issue 1 Winter 2017

# Updates Create Service Improvements

Alison LaCarrubba, DVM, DABVP

We have had a busy summer and fall at the Veterinary Health Center so our newsletter is arriving a little late this year. We have welcomed three excellent interns to our program. Please read their interesting biographies about past experience and future plans. We are fortunate to be working with some talented individuals. We are also excited to announce that Martha Scharf, DVM, has completed the credentials to become a Diplomate of the American Board of Veterinary Practitioners (Equine Practice) this year. A big congratulations goes out to Dr. Scharf! Board certification takes years of preparation, attention to detail and hard work, and promotes excellence in our field. We are both proud to continually strive toward excellence and continued learning.

The Large Animal Ambulatory Facility was completed this year. This has provided us with incredible garage space with storage, office space and a brand new conference room. The most exciting part is that the trucks will no longer be frozen or iced over in the mornings. We are grateful to Missouri Senate and House Agriculture Committee to expand MU's large animal veterinary medicine program, along with former Dean Neil C. Olson, DVM, PhD, and CVM Professor John Middleton, DVM, PhD, for working so hard to see this project to completion.

I would like to bring everyone's attention to a few important medical issues that have been rearing their heads this year. There has been an outbreak of pigeon fever in the St. Louis area. Pigeon fever was given its name because the abscesses often form in the pectoral region of the horse, giving them a pigeon breast appearance. The other issue we seem to have been dealing with quite a lot this year is foxtail ingestion. Foxtail is a weed that can contaminate pastures and hay and causes significant gingivitis and oral ulcerations when eaten. Please read the associated articles for more information on these particular issues.

The Large Animal Ambulatory building provides space for offices and a classroom on the upper level. The lower level offers garage bays for the ambulatory vehicles: fully stocked trucks that travel to farms to diagnose and treat the medical and surgical needs of animals.

We would like to wish you, both horse and human, a happy and safe holiday season. As always we would like to thank you for your continued support of the Equine Ambulatory Service. Our students, interns and all of our veterinarians are so grateful for the opportunity to work with you.

*Alison LaCarrubba, DVM*
*Associate Teaching Professor*
*Diplomate, ABVP (Equine Practice)*

# Meet the MU Equine Ambulatory Team

## Alison LaCarrubba, DVM, DABVP

Alison LaCarrubba, originally from New York, grew up riding hunter-jumpers and dressage from a young age. After graduating from Cornell University with a degree in animal science, LaCarrubba moved to the Midwest to obtain her veterinary degree. She graduated from the University of Missouri College of Veterinary Medicine in 2001. LaCarrubba completed an internship in equine medicine and surgery at the university and subsequently spent a year working in an equine exclusive private practice. She returned to the university in July 2003 as a clinical instructor, and in 2009 she completed the specialty boards with the American Board of Veterinary Practitioners in Equine Practice.

LaCarrubba's love of equine dentistry has inspired her to continue her training in this area. In recent years she has attended a variety of advanced equine dental courses, which has allowed her to develop specialized skills and expertise in this field. As the equine dentist for the university, LaCarrubba is excited to see all things dental, from routine work to more complicated extractions. When she is not at work, she is spending time with her husband and three children. The whole family enjoys horses and riding together on Missouri's beautiful trails.

## Martha Scharf, DVM, DABVP

Martha Scharf practices equine ambulatory medicine at the Equine Hospital. Scharf was born in Chicago and grew up riding hunter-jumpers in St. Louis. Since moving to Columbia she has continued to ride and started to explore three-day eventing. After earning a DVM at MU, she completed a rotating equine internship at the university. She continues to work as a clinical instructor for the Equine Ambulatory Service.

Scharf spends the majority of her time instructing senior veterinary students while providing quality medical care for horses within the Columbia area. She is particularly interested in wound management and emergency care in the ambulatory setting. Scharf works closely with the referral clinicians in the Equine Hospital to provide superior care to horses.

Our interns have a special interest in working with horses and potentially going on to complete a residency, specializing in either equine medicine or equine surgery. Every June we welcome a new crop of interns. This year our interns include Alexandra Comly, Fallon Segarra and Kile Townsend.

## Alexandra Comly, DVM

Alexandra Comly, who is better known as Sunny, has been riding horses since before she could walk. Throughout her youth, she traveled throughout the country competing in hunter-jumper competitions. She earned an undergraduate degree in animal sciences at Texas A&M University  She then spent almost two years in Germany where she competed with her horse Charlie and worked for a referral equine practice as a veterinary technician. She earned a doctor of veterinary medicine degree from Ross University at St. Kitts and spent her clinical year at the University of Missouri. She is interested in equine lameness, performance horse medicine, gastroenterology, surgery, and neonatology. She has a horse named Taz who is competing at the Grand Prix jumper level with her sister.

## Fallon Segarra, DVM

Fallon Segarra grew up in Maryland and Virginia with a horse-crazy mom who had ridden most days since she was 12 years old and was not about to let a little thing like motherhood interrupt her streak. As a result, Segarra grew up running beneath and between the legs of horses and rolling in mud puddles. As soon as she was old enough to recognize equine injuries, she began tagging along with the family veterinarian and learned the importance of a healthy relationship between client and doctor. After quickly deciding she wanted to be on the doctor side of this agreement, she never looked back.

Segarra earned undergraduate degrees in biology and studio art from Stanford University in 2012, and her DVM from Auburn University College of Veterinary Medicine in 2016. Throughout school, she worked for upper-level

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# Equine Infectious Anemia (Swamp Fever)

Kile Townsend, DVM

### What is EIA?

Equine infectious anemia is an infectious disease of equine species sometimes referred to as swamp fever because it was originally seen in horses living in swampy regions. Horses, donkeys, mules and zebras can be affected.

EIA is caused by an RNA virus that is classified in the *Lentivirus* genus, family Retroviridae and it is found worldwide. It can produce severe disease or death, and can also occur as a lifelong subclinical carrier state.

The virus reproduces in the horse's white blood cells, part of the horse's immune system. The immune system, attempting to kill the virus, creates antibodies, which can cause red blood cells to be attacked leading to anemia. The inflammatory response associated with the infection may also damage vital organs (bone marrow, liver, heart, kidney). Since the horse's immune system is working hard to destroy the virus, horses can become susceptible to other infections such as pneumonia. Due to the affect of the virus and the body's immune response, horses may die from the virus itself or from secondary infections.

### How is it spread?

EIA is spread in summer via blood by blood-feeding insects between horses in close proximity. Bloodsucking horse flies, deer flies, stable flies, and possibly mosquitoes are all vectors for the disease. The way in which the flies transmit the disease is mechanical; the infected blood from the flies' mouthparts contaminates the blood of another horse during feeding. For example, a fly will transmit disease by biting an infected horse, that horse will activate a defense response to the painful or irritating bite (i.e. twitching the skin or swishing the tail) to disrupt the feeding fly. The same fly then goes to a new horse to feed, bringing contaminated blood on its mouthparts to infect the new horse.

EIA also is transmitted via blood-contaminated syringes, needles, or surgical equipment, or by transfusion of infective blood or blood products.

It can be spread from an infected stallion to a mare during breeding and from a mare to an unborn foal in infected mares that experience one or more clinical episodes during pregnancy.

### What are clinical signs of EIA?

There are three forms of EIA:

1. Acute: Symptoms last three to five days and appear within one to two weeks after the horse's first exposure to the virus. Clinical signs include high fever, sweating, nasal discharge, weakness and severe anemia. It may be difficult to diagnose the infection at this point because the immune system has not yet had a chance to make many antibodies to the virus.

2. Chronic: if the horse survives the acute phase, a chronic phase may occur. This consists of waxing and waning fever, weight loss, emaciation, ventral edema, pinpoint hemorrhages on the mucus membranes. Repeated flare-ups can occur and they correspond to increased levels of virus in the bloodstream due to some type of stress on the horse's immune system.

3. Inapparent: As the time from initial infection increases (within a year), some horses may enter a state

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*Interns, continued from page 2*

hunter-jumper trainers, in veterinary hospitals, and on a dairy farm. She completed her first internship at Peninsula Equine Medical Center.

While her interests have expanded to include ophthalmology, lameness, and in-hospital care, her belief in open communication between veterinarians and clients, has remained steadfast.

Kile Townsend, DVM

Kile Townsend grew up on a small horse farm in Dover, New Hampshire, where she learned to ride and handle horses at a young age. She was an active member of the United States Pony Club in her region for many years with her Welsh standardbred pony, Java, and her Connemara thoroughbred mare, Topper. She has a background in eventing and dressage and was a competing member of the Intercollegiate Horse Show Association and Intercollegiate Dressage Association teams at her undergraduate university. She received her DVM in May 2017 from the Atlantic Veterinary College in Prince Edward Island, Canada. While there, she learned a lot about the standardbred racing industry.

Townsend has always wanted to work with horses and she is ecstatic to be able to join the team at MU for her equine rotating internship. In the future, she plans to stay in equine practice and in academia. She enjoys teaching veterinary students and hopes to work at a veterinary school teaching hospital.

# Combine Therapies to Treat Sarcoids

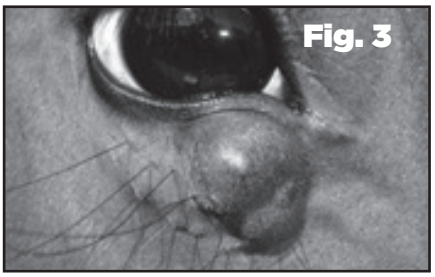
Martha Scharf, DVM, DABVP

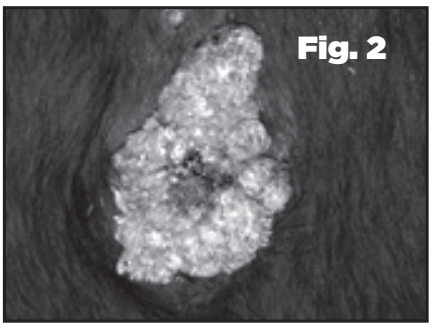
Sarcoids are the most common skin tumors seen in equids, including horses, ponies, donkeys, mules and zebras. These dreaded lesions represent approximately 20 percent of all cancer seen in horses and 35 percent of skin cancer. Although no gender or age predisposition is observed, they do occur more frequently in donkeys and mules than in horses.

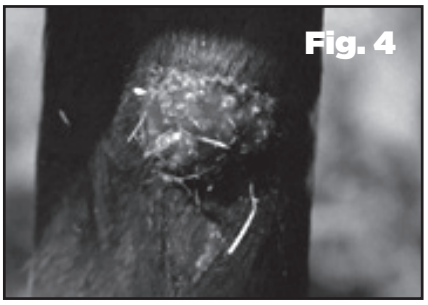
These tumors are thought to be caused by bovine papillomavirus, most likely spread by flies on wounds and body openings like eyes, ears, and gential regions. However, there is evidence that the virus can also be spread by shared tack, stable equipment or pastures. A horse's own immune response to the virus plays a role in the tumor growth and type. Therefore, once a horse has one sarcoid, they are often predisposed to recurrence and development of new lesions.

The effect of equine sarcoids can range significantly based on their location and type. Most are a management and cosmetic problem but they can become severe enough to limit function and quality of life.

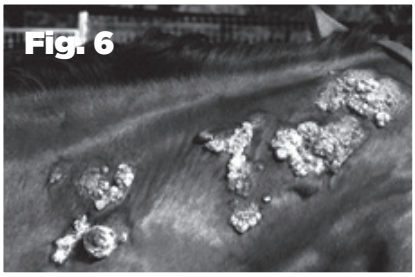
Sarcoids are highly variable in appearance and are often first mistaken for a variety of other lesions, like wounds, proud flesh, scars, summer sores, ringworm, fungal plaques, warts or other types of tumors. Due to the disparity in their form, they are classified into six distinct types (Please see images and text in adjacent box):






1) Occult are flat, gray, hairless, flaky and persistent. They are often roughly circular and may be mistaken for ringworm or rub areas, but palpation often reveals short, rough bumps.

2) Verrucos are gray, scabby, and warty, with small nodules. They may have ulcerated or raw areas, but the surface is typically thickened or hyper-keratinized. They may have sharp margins or be ill-defined.

3) Nodular are single or multiple discrete solid nodules of various size, and may be attached or independent of skin. They can have intact skin or open ulcers.

4) Fibroblastic are fleshy, raw masses, often ulcerated and sore, they may have a thin stalk or wider base. They bleed easily.

5) Mixed are variable mixtures of two or more types.

6) Malevolent or metastatic are rare, and are characterized by extensive infiltration and aggressive spread through the skin and underlying tissues.

Despite numerous and varied treatments for sarcoids, they often reoccur. No single treatment is effective for all types and inappropriate treatment can worsen the growth or appearance of a lesion. If you suspect a sarcoid on your horse, a veterinary visit is indicated to help determine the appropriate next step.

Surgery is often the first treatment attempted due to its ease and cost effectiveness. However, reoccurrence following simple excision is very common due to incomplete removal stimulating viral particles. Therefore, surgery can be combined with or substituted for

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# Preventing Pigeon Fever Spread May Require Isolating Infected Horses

Lynn M. Martin, DVM, MPH

*Corynebacterium pseudotuberculosis* is a bacterium that affects many species, and in horses, it is known as pigeon fever or dryland distemper. There are three forms of infection: ulcerative lymphangitis (limb infection), external abscesses and internal infection (often abscesses as well). Clinical signs may include swelling and lameness in one or more limb, lethargy, anorexia and fever. However, most commonly, an abscess will form in the chest/pectoral muscle area near the forelimbs. On rare occasions, internal infections are seen.

The disease dwells in the soil throughout North America. The condition is contracted through abrasions in the skin or contact with infected environments and

is spread by flies and horse-to-horse contact. A diagnosis is confirmed by bacterial culture of the abscess contents or through a synergistic hemolysis inhibition titer test of the blood.

Treatment usually involves drainage or lancing of the abscess if it is near the skin. Antibiotics and other medications are also often necessary for treatment depending on the form of disease. Horses that have a draining abscess should be isolated from other animals to reduce exposure and disease spread. Confinement is also important because the bacteria can survive in exposed soil for months to years, and there are no practical ways of removing it from the environment other than time. The disease prevalence changes from year to year due to immunity acquired within horse herds and environmental factors such as rainfall and temperature. The highest number of cases occur in the summer and fall.

If you suspect your horse has pigeon fever, isolate the horse and call your veterinarian to develop a diagnostic, treatment, and a plan for quarantine and disinfection.

*Sarcoids, continued from page 4*

other therapies available through the ambulatory service include freezing (crypotherapy), chemotherapy, and topical treatments, such as imiquimod, antivirals, bloodroot or bacterial product immunostimulants.

Additionally, advanced options can be pursued at many equine hospitals, including laser surgery, further chemotherapy alternatives, and radiation therapy. Combinations of many of these therapies may be used for large or aggressive tumors.

Although sarcoids can be frightening, unsightly, and difficult to treat, many options exist to manage them. No two tumors are the same but most regimens have a success rate of 60 to 85 percent, depending on the treatment and tumor types.

*EIA, continued from page 3*

of an inapparent carrier. The horse is still infected with the virus, but the clinical signs are mild and controlled by the horse's immune system. These horses are carriers and are a constant, silent source of disease to others.

### How do you test for EIA?

- Testing is recommended annually because EIA is highly monitored in the U.S. and a notifiable disease in Canada.
- An ELISA test can be performed at accredited laboratories for screening.
- Coggins AGID test is confirmatory.

### How can you prevent infection?

- Routine Coggins tests: Have your veterinarian test all new horses before bringing them onto the farm.
- Stable horses inside at night to minimize exposure to fly vectors.
- Always clean and dispose of medical equipment properly.
- Avoid sharing tack and equipment with other horses.
- Keep EIA positive horses at least 200 yards away from other horses to prevent fly vector transmission.

### How is EIA treated?

- There is no specific treatment or vaccination for EIA.
- Prevention of EIA infection is vital, as EIA cannot be cured once acquired by a horse.
- If a horse is positive for the EIA virus, federal and state health agencies, and the American Association of Equine Practitioners, support euthanasia. If not euthanized, horses testing positive for EIA virus are required by law to be permanently identified via branding or tattooing and be quarantined.
- The only way to eradicate the disease is to eliminate the inapparent carriers.

# Proper Dental Care Can Add Years and Quality to Geriatric Horses' Lives

Alison LaCarrubba, DVM, DABVP

As our horses live longer lives, our medical model and understanding of geriatric conditions is important to providing optimal veterinary care. An intricate understanding of nutritional needs, endocrine diseases, common musculoskeletal issues and geriatric dental conditions is critical to managing these older horses. We have come a long way over the years, and owners are more committed than ever to providing the best possible care for their geriatric equine companions.

One of the greatest contributing factors to improved quality of life of older horses has been the introduction of complete pelleted feeds targeted to our senior horses. These feeds are high in fat and easily digested fiber allowing the horses to exist exclusively on this diet rather than meeting their energy needs through more difficult to digest feed sources such as coarse hay, oats and corn. One of the common reasons that geriatric horses begin losing weight involves poor dentition and an inability to efficiently and effectively masticate their food.

It is critical to stay on top of our geriatric horses' dental issues. Horses' teeth are designed to erupt throughout their life, which on average is 30 years. As horses approach their later years they undergo dental attrition, which means the teeth are worn out. The normally rough occlusal surfaces, which are designed to chew rough forage sources well, become smooth and cupped, making them a dysfunctional grinding surface. Along with this, many of the teeth become loose or even get infected and abscess. In order to do all we can to allow these geriatric horses to continue with a good quality of life, we need to address their dental needs, with thorough oral examinations, routine dental equilibration as well as extracting loose and damaged teeth in order to provide comfort and maximize the grinding surface that is left.

Equine odontoclastic tooth resorption and hypercementosis is a relatively newly recognized disease of geriatric horses. This disease affects primarily incisors and canine teeth and causes abnormalities of the root systems, along with feed packing, fistulous tracts, fractured teeth, and significant pain. There is no cure for this disease, but the solution is to remove all affected incisors. It is incredible how well these older horses can do even when all of their incisors have been removed.

One of the common clinical signs of dental pain or dysfunction is called quidding, which is dropping semi-chewed hay from the mouth, and these little hay balls are found in the stall and paddock. Other signs of dental or oral cavity pain include dropping feed, drooling, turning the head to the side to chew, or refusing feed. Older horses with dental pain or issues can "feed pack," typically noted along the cheeks. This is where balls of feed build up because the horse is too painful to work the feed around and free it up. Sometimes these feed packs are mistaken for masses on the face when they are really the result of dental issues.

Thorough oral cavity examinations are only one piece of the larger picture of overall geriatric care, but a very important piece. Proper dental care and nutrition can literally add years to our geriatric friend's lives.

# Genetics Can Play A Significant Role in Equine Weight Loss Resistance

Philip Johnson, BVSc, DACVIM, DECVIM

It is readily apparent that many horses and ponies develop obesity in modern management systems. The reasons for this problem are multiple and may be summarized as: rich forage quality, reduced work expectations (mostly used for leisure), excessive feeding (beyond basic nutritional requirements), and feeding to maintain positive energy balance throughout winter.

Equine obesity is a significant welfare issue facing the equine industry because it promotes insulin resistance (coupled to an increased risk of laminitis) and is detrimental to both athletic and reproductive performance.

Husbandry methods that have led to the obesity epidemic are unlikely to be significantly revised in the short term, so veterinarians are often called upon to provide safe and appropriate advice pertaining to weight management for enlightened owners of individual horses and ponies. Similar to the case for people, advice intended to promote weight loss is linked to imposition of a negative energy balance through both dietary restriction and enhanced exercise. However, increasing exercise is detrimental if the equine patient has already developed laminitis Consequently, veterinarians may only be able to recommend dietary restriction in order to reverse obesity and to improve insulin sensitivity.

The imposition of an excessively severe dietary restriction is associated with risk of hyperlipemia/hepatic lipidosis in certain insulin resistant breeds (especially ponies, miniature horses and donkeys) as a result of dangerous (potentially fatal) lipid mobilization. Moreover, profound curtailment of access to forage can lead to behavioral changes, such as stall chewing, ingestion of wood and gravel and ulcerative gastritis, etc., that may be detrimental.

The extent to which dietary restriction results in weight loss has been studied recently. As reported for other species, the extent to which an individual horse or pony loses weight when subjected to dietary restriction is highly variable. In this regard, some individuals are described as "weight loss sensitive" and others that fail to lose weight so readily are described as being affected by "weight loss resistance." For example, in one equine study, weekly rates of weight loss in the most diet sensitive ponies were more than threefold greater than those recorded for the most diet resistant individuals. In that study, several parameters were evaluated in order to identify predictors for weight loss responsiveness within the group, including sex, breed, diet, body condition score, body mass index, indices of insulin resistance, body composition and fat depths. Sensitivity to dietary restriction was shown to be independent of any measured outset variable and was significantly (65 percent) attributed to animal identity, i.e. genetic. Results of studies in laboratory rodents have also suggested that, at least for mice, weight loss responsiveness during dietary restriction is under genetic control with a heritability of 40 to 50 percent.

There exists a broad range in weight loss and animals at the extremes of the range may represent weight loss resistant (WLR) and weight loss sensitive (WLS) phenotypes. The heritability of WLR in horses and ponies, as well as its association with obesity, has clear implications for management as well as for selective breeding and deserves further investigation.

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*Weight Loss, continued from page 7*

Initial weight loss is not consistently maintained through dietary restriction alone. In humans, this loss of efficacy is attributed to an adaptive suppression of the resting metabolic rate, associated with increased cellular respiration efficiency in skeletal muscle. Similarly in humans, when coupled to physical exercise, dietary restriction is associated with less loss of lean tissue, which tends to offset this adaptive suppression of resting metabolism.

In the future it might be possible to identify WLR patients in need of obesity reversal through measurement of specific biomarkers. Such early detection would likely enable more efficacious weight reduction strategies, such as a higher level of dietary restriction, increased exercise, or coat clipping during winter, to provide for a greater negative energy balance and promote improved long-term maintenance of obesity reversal.

Of further interest during these studies of dietary restriction for promotion of weight loss, it was reported that the body condition score (BCS) correlated poorly with changes in body mass. However, circumferential body measurements and ultrasonographically determined depth of the retroperitoneal, ventro-abdominal fat depot did decrease progressively during the weight loss program.

Loss of body fat, associated with reduced body mass, during dietary restriction may be selectively occurring in covert adipose repositories within the body cavities — central obesity. Visceral adipose tissues are more readily depleted during early weight loss in human subjects. Paradoxically, in the equine studies, the depth of some subcutaneous fat depots increased significantly during dietary restriction. In consideration of the fact that body condition score is significantly determined based on assessment of subcutaneous fat depots, it is not surprising that BCS is a poor indicator of body mass and total body adiposity during dietary restriction.

For obese animals, weight loss should be initiated by restricting daily forage dry matter intake to 1.25 percent of body mass (BM). Subsequent restriction to 1 percent BM may be warranted for WLR individuals.

Soaking hay in water has been recommended for the purpose of reducing the caloric content of forage in the management of equine metabolic syndrome (EMS). There's substantial evidence that the provision of soaked hay will reduce glycemic and insulinemic responses to feeding, so it can be recommended as part of the management of EMS. Glycemic and insulinemic responses are linked to laminitis risk.

The extent to which hay soaking impacts the non-structural carbohydrate (NSC) and water-soluble carbohydrates (WSC) and overall nutrient content of hay has been incompletely explored and results published hitherto have been somewhat conflicted. In a recently published study, soaking hay led to a consistent decrease in both NSC and WSC content (bringing both indices into an acceptable range for EMS management). Although crude protein content was not affected by soaking, the electrolyte and mineral content of soaked hay was significantly compromised. Therefore, if provision of soaked hay is recommended for long-term weight loss and EMS management, loss of electrolytes and water soluble minerals should be anticipated and a feed balancer product, to address minerals and electrolytes, should be incorporated into the planned ration.

Most of the recent studies on the effectiveness of soaking hay have been undertaken in the United Kingdom. The effect of soaking hay on American Midwestern forage is deserving of further specific investigation. Not to be forgotten, an undesirable side effect of excessive hay soaking to reduce sugar content is its effect on mold development. Hay soaked for much longer than a couple of hours can develop high mold content and could be detrimental to asthmatic horses.

# Weed Can Cause Dental Problems

Foxtail is a common weed in mid-Missouri and the conditions have been ripe for its growth during the past couple of years. We have really seen a significant increase in the amount of foxtail in our hay and pastures and an increase in the issues associated with this weed.

Foxtail ingestion can cause significant gingivitis, stomatitis, and oral ulcerations. Some horses will go off feed, or you will notice drooling and others seems to take it in stride showing few if any clinical signs. It is important to be able to recognize this weed in pastures and hay in order to prevent ingestion by horses.

If horses do develop gingivitis from foxtail ingestion the best thing to do is to stop feeding the affected hay and begin rinsing the mouth with dilute chlorhexidine solution in order to allow for proper healing.

# Horses, Bones and Exercise: How The Skeleton Responds to Training

Fallon Segarra, DVM

In the thoroughbred racing industry, millions of dollars are lost every year to missed training days. The vast majority of these days are due to lameness, with bone and muscle issues being the predominant cause. Having a basic understanding of how bone models and remodels will allow horse owners and trainers to adjust training protocols to minimize bone damage, missed training days, and lost revenue.

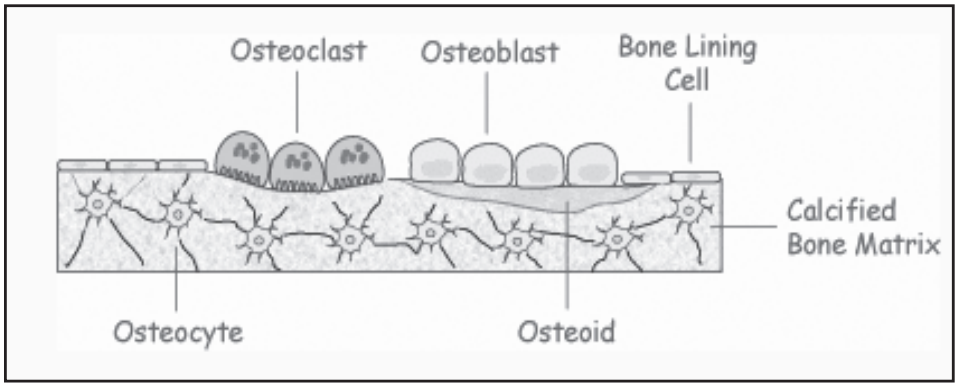


Figure 1: The different types of bone cells.

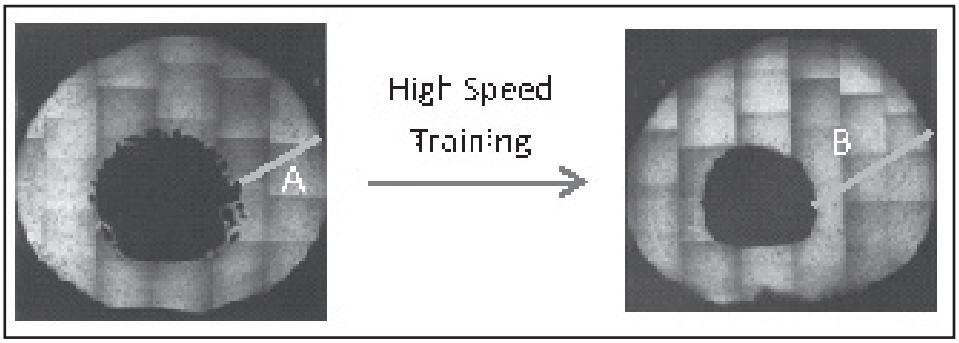


Figure 2: The slice of cannon bone on the left is from a thoroughbred horse that has not undergone training. The slice on the right is from one that has. Notice that the distance B is greater than the distance A. This indicates bone adaptation to high speed training.

## The Body's Response to Exercise

Whether horse or human, the body is adapted to move. Any physical activity increases heart and respiratory rates to accommodate higher oxygen and energy requirements by the muscles. Consistent activity causes the muscles themselves to grow and become more efficient. This may not be news to anyone; however, what you may not realize is that even bones can adjust their configuration and density in response to regular work.

Consider a previously broken limb that is fresh from a cast; it is thin and weak from disuse and requires gradual physical therapy to get back to doing everyday tasks such as walking or carrying things.

This same process happens in thoroughbred racehorses. Bone strength increases with race training and decreases with rest, illustrated in Figure 2 by the larger width of the cannon bone that has undergone high speed training.

## Skeletal Cellular Basics

### Bone Remodeling

Within each bone, there are several types of cells. Of these, the big players are osteocytes, osteoclasts and osteoblasts. Osteocytes are the basic building blocks of bone. Osteoclasts chew up and remove old and damaged osteocytes in order to make room for the osteoblasts to build new osteocytes. Osteoclasts and osteoblasts work together to maintain balance within the bone. This process is known as bone turnover or remodeling.

The primary goal of bone remodeling is to create bones that withstand the stresses and loads placed on them. Teams of osteoclasts and osteoblasts add more osteocytes in areas under greater stress, making these areas denser and stronger, and fewer osteocytes in those receiving less stress. In young horses, this process is exaggerated compared to adults, allowing for a skeleton that is better adapted for the activities that the young horse is performing. These adaptations carry over into adulthood.

Early training in racehorses is highly beneficial as it creates bones that are stronger and better suited for racing. The catch is finding a training program that balances the application of enough stress on the bones to elicit the needed adaptations with the rest periods necessary for damage control.

### Bone Modeling

The removal of damaged, or fatigued, bone by osteoclasts can only happen when the bone is not under intense loading. Bones without rest periods cope by a process called bone modeling. In this process, new bone is laid

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*Bones, continued from page 9*

over and around old bone like a scaffold in an attempt to provide extra support. Unfortunately, the remaining fatigued bone continues to collect damage and acts as a point of weakness within the bone. The adage, "A chain is only as strong as its weakest link," is applicable here.

Without osteoclast clean up, bone fatigue will continue to accumulate until the point of fracture. Providing regular rest periods for thoroughbred racehorses, and other equine athletes exposed to high intensity training, will go a long way in decreasing the frequency of bone disease. Unfortunately, more research must be done in order to determine just how long and often these rest periods need to be. In the meantime, other approaches to maintain bone balance are available.

## Recommendations

For reducing load strains within bones and joints, the following should be considered:

1. **Balanced work**. Teaching the horse and the rider proper balance will minimize unnecessary distortion of tendons and ligaments in the distal limbs. This results in less stress on the horse's bones and joints.
2. **Proper hoof care.** Maintaining the correct center of the foot will minimize ground reaction forces and strain on the bones.
3. **Early start.** Starting training when a horse is young takes advantage of the bones' peak adaptability and allows for stronger and better-suited bones into adulthood.
4. **Interval training.** Research shows that many short bursts of high speed exercise are better at minimizing bone fatigue (while also maximizing bone adaptation) than the same number of longer (and slower) gallop workouts.
5. **Gradual return to work.** While rest is important for remodeling, the initial step of osteoclast clean up causes increased porosity that can weaken the bone. Slow reintroduction to work after a significant rest period is important to prevent acute damage.
6. **Judicious use of pain medications.** While extremely helpful when used appropriately, masking pain with medications such as nonsteroidal anti-inflammatories and intraarticular steroids can cause continued accumulation of bone damage to the point of complete failure.

When you (or a horse) take part in physical activity, the muscles used have a greater need for oxygen and energy than when they are at rest. The body accommodates the increased oxygen demand by increasing the respiratory rate to get more oxygen into the bloodstream, and increasing the heart rate to get that oxygen-rich blood to the muscles faster. The increased respiratory and heart rates also allow faster removal of waste products (such as lactic acid) from the muscles whose buildup would otherwise cause painful cramping.

The muscle tissue's increased demand for energy is less reliant on the immediate increase in respiratory rate. It instead relies on the release of stored energy from liver cells, muscle cells and fat deposits.

The muscle tissues that are used more often will also become more efficient at using the available oxygen and energy. This process of increasing efficiency is dependent on the types of activity you take part in on a regular basis.

A good way to think about this is by comparing a body builder to a marathon runner. The body of a body builder is large and uniformly well-defined because he or she spends time on each aspect of their body.

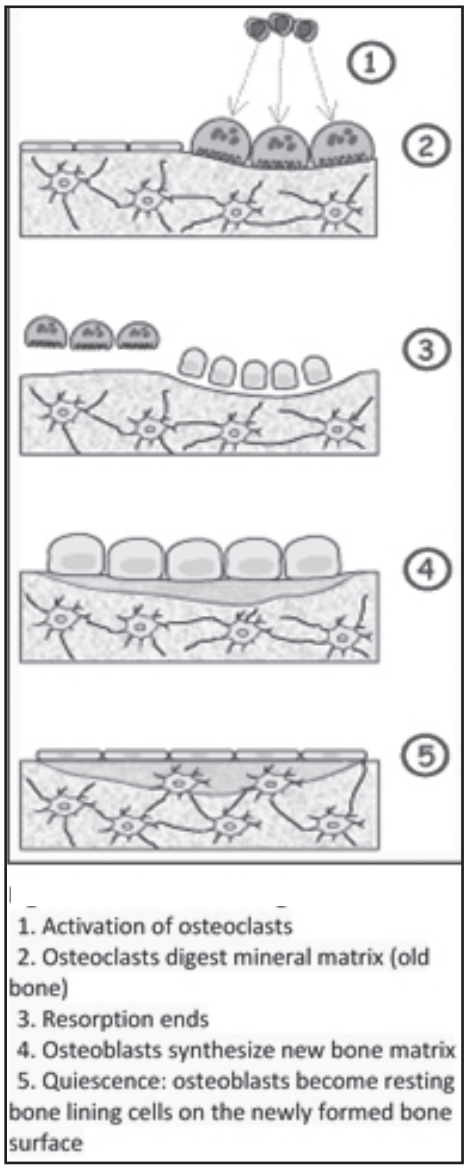


Figure 3:

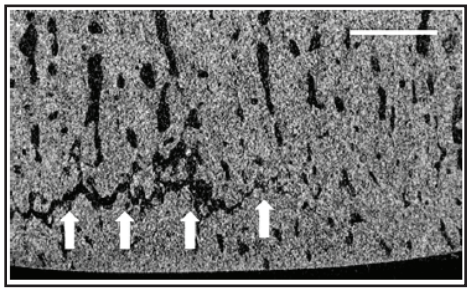

Figure 4: This high resolution computed tomography image (a zoomed-in version of a CAT scan) of bone surrounding a joint (joint surface along bottom). The arrows show the start of a fracture resulting from bone fatigue accumulation.

The marathon runner, on the other hand, has relatively large leg muscles,

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# Equine Gastric Ulcer Syndrome is a Significant Issue for Many Horses

Alexandra Comly DVM

Gastric ulcers are more common than one might expect. Why do they occur? What are the symptoms? How do we treat them?

Gastric ulcers are a common medical condition in horses and even foals. Approximately one-third of adult horses confined in stalls may have mild ulcers and this number is even greater in performance horses and race horses. Gastric ulcers can affect horses of any age or breed. Gastric ulcers, classically referred to as "equine gastric ulcer syndrome" (EGUS) can present quite a problem for horse owners of all disciplines.

### What is the cause of gastric ulcers?

The equine stomach has two distinct parts: the non-glandular portion, which is lined by cells similar to the esophagus, and the glandular portion, which is lined by secretory cells. The glandular portion of the stomach produces hydrochloric acid and pepsin, the enzyme required for digestion of food in the stomach. When considering human gastric ulcers we understand that hydrochloric acid is produced as a response to eating. In horses, hydrochloric acid is produced continuously (as they are typically continuous grazers) and the acid accumulates in the stomach, which can irritate the non-glandular portion of the stomach.

Horses that do not have regular access to food are prone to EGUS. Horses evolved to be grazers, meaning they are supposed to eat many small meals frequently, which prevents the stomach from being empty. Feeding a high grain diet can predispose horses to ulceration because when horses eat concentrates (grain) they do not produce as much saliva as compared to when they eat roughage (hay). Saliva helps to buffer the acid in the stomach. Roughage requires more chewing which promotes the production of saliva. Long-term use of non-steroidal anti-inflammatory drugs like Banamine or phenylbutazone block the production of beneficial chemicals that decrease acid production in the stomach. When horses are on Banamine or phenylbutazone for long periods of time, the beneficial chemicals are low and the acid levels are high. High-stress environments can also predispose horses to EGUS. Stress in horses can be due to transport, stall confinement (intermittent feeding and lack of exposure to other horses), or competitions and races.

### What are the symptoms of gastic ulcers?

Symptoms of gastric ulceration in horses can be varied. Some of the common symptoms include:

- Decreased performance — refusal to jump, slowed racing times
- Irritation upon grooming in girth area, biting when touched on flank or under belly
- Mild colic signs
- Change in attitude
- Weight loss, poor appetite
- Lying down more than normal
- Teeth grinding when girth is in place or after eating

In order to definitively diagnose gastric ulcers, the integrity of the stomach lining may be examined with an endoscope, otherwise known as a gastroscopic examination or gastroscopy.

### How can gastric ulcers be treated?

The proton pump inhibitor omeprazole is the most commonly used treatment for gastric ulcers. Other options are histamine blockers (cimetidine, ranitidine), and gastroprotectants, such as sucralfate, are drugs that mechanically protect the stomach from the acid. There are numerous supplements on the market available for horses that need preventive care. Omega-3 fatty acid supplementation helps to reduce inflammation and can be beneficial for horses with history of EGUS.

Changes in management should be implemented for horses with gastric ulcers. Continuous grazing or free choice access to roughage is protective and helpful in horses predisposed to EGUS. Concentrate (grain) should be decreased, if possible, and supplements can be added to the diet, such as vitamins, minerals and vegetable oil, to add to the calories the horse may need. Of course it is important to discuss any feed changes with your veterinarian in order to individualize therapy.

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*Bones, continued from page 10*

but usually considerably less upper body strength.

Similar to muscles, bones respond to different activities because of the various forces placed on them. A simple way to think about them is to consider the difference in fracture risk between an active child and an inactive elderly woman. The child is at a lower risk of fracture because her bones are denser from constant use, while the older woman is at a greater risk due to decreased bone density from age and decreased activity levels.

As with everything relating to horses, the key to musculoskeletal injury prevention depends on the balance of a variety of factors. As the research progresses, the recommendations will change and new resources will become available, but at this particular moment in time, there is no perfect system.

Secretariat's morning workout.

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