Imaging Techniques

A new approach to treatment planning is an examination and recovery from musculoskeletal injury is built upon the foundations of an accurate diagnosis and detailed characterization of the pathology. Radiography, and ultrasound are the cornerstones of the evaluation, but careful study of the conformation and condition of the joints may provide unique information about common lesions. Many horses have musculoskeletal injuries that are not easily diagnosed with any of these modalities. When MRI is available, it provides an excellent characterization of the area of interest. The strength of MRI is its ability to provide detailed information of soft tissue structures and to highlight areas of injury that are not often seen with any other modality. In addition, it is more reliable for assessing tendon, ligaments, and soft tissue in horses. Imaging at the appropriate slice thickness is critical to appreciate the effects of tendon and ligament injuries.

Contrast enhancement with CT is another useful imaging technique. High resolution CT images obtained using low-dose, high-resolution CT imaging without the need for general anesthesia. With this method, multi-planar contrast can be acquired in rotational and can help enhance visualization of pathology. Computed tomography (CT) has been used to define the disease and characterizations of sites of injury with greater detail and accuracy, and for the fat imaging of soft tissues. CT can be used to demonstrate bone fractures, high and low ringbone, subchondral bone lesions, thoracolumbar spinous processes (kissing spines), and paranasal sinus disease related to ethmoidal disease. CT can also be used to assess the size and shape of the skull. Another useful imaging technique is nuclear scintigraphy to highlight areas of injury that are often not seen with other modalities. The strength of MRI is its ability to provide detailed information of soft tissue structures and to highlight areas of injury that are often not seen with any other modality. In addition, it is more useful for assessing tendon, ligaments, and periarticular soft tissue in horses.

Invasive techniques such as bone biopsies, cartilage, and synovial fluid are also useful in the diagnosis of musculoskeletal injury. These can be performed under ultrasound or fluoroscopic guidance. Imaging techniques such as CT, MRI, and nuclear scintigraphy may be helpful in cases where surgery is planned.

In comparison to other imaging techniques, CT and MRI are the most useful in the diagnosis of musculoskeletal injury. CT provides excellent visualization of bone and soft tissue detail, while MRI provides excellent visualization of soft tissue detail. Ultrasound is useful in the diagnosis of musculoskeletal injury due to its high resolution and ability to image in real-time. However, CT and MRI are more useful in the diagnosis of musculoskeletal injury due to their ability to image in three dimensions and provide detailed information about the disease process.

State-of-the-Art Imaging Techniques

When these images are evaluated collectively, they provide an excellent characterization of the area of interest. The strength of MRI is its ability to provide detailed information of soft tissue structures and to highlight areas of injury that are not often seen with any other modality. In addition, it is more useful for assessing tendon, ligaments, and periarticular soft tissue in horses.
Equine Pythiosis

The clinical signs of infection caused by the pathogenic protozoan Pythium insidiosum are a diffuse inflammatory disease process that is self-sustaining.

Mycotoxins are toxic metabolites produced by fungi on stored grains and feeds. Their production is influenced by several factors, including temperature, humidity, and the storage conditions of the feeds.

Equine Cutaneous Leishmaniasis

The disease is caused by the Leishmania donovani complex, a protozoan parasite that infects the skin of horses, dogs, and other animals. The clinical signs of the disease include cutaneous nodules, ulcerative lesions, and lymphadenitis.

Dogs are the most common affected species, followed by horses and other animals. The disease is transmitted through the bite of infected sand flies of the genus Lutzomyia, which is the summer in Brazil, highly favoring the transmission of the disease.

In horses, skin lesions are more frequent in the head, neck, and abdomen, while in the United States, this disease has been observed in significant quantities in corn grown in regions affected by extreme weather. In North America, 2012 were reported to cause reduced concentrations of feed intake. It appears that the frequency of mycotoxin contamination of feedstuffs is increasing. This may be due, in part, to unfavorable growing conditions such as high temperatures and humidity, which favor the growth of mycotoxigenic fungi.
Economic significance of feed-borne mycotoxins has been the focus of many studies. The economic impact can be significant, as mycotoxins can reduce feed intake, digestibility, and growth rate in animals. In addition to the direct economic loss, mycotoxins can cause long-term health effects in animals and humans. Therefore, monitoring and management strategies are essential to reduce the economic impact of mycotoxins. Mycotoxicosis can be prevented by using mycotoxin-free feed, implementing good storage practices, and using mycotoxin-binding feed additives. These strategies can help minimize the economic losses associated with mycotoxins. Overall, mycotoxins continue to be a significant concern in the livestock industry, and ongoing research is needed to better understand their impact and develop effective management strategies.
Current Thoughts on the Significance of Mycotoxins

Mycotoxins are toxic metabolites produced by molds (fungi). Due to contamination of the economically important foods-here mainly grains-and forage crops, mycotoxins are a major concern in the livestock industry. Grain crops, forage crops, and grassland stock in the USA, Europe, and even China have been contaminated with mycotoxins. Induced cases of EHV-4 respiratory disease were observed in Germany (Frisch and the UK).

**Equine Pythiosis**

The study of wound temperatures, blood flow, and apical viability helped to define the gold-standard techniques to validate and maintain the pythiosis model, a preclinical model of systemic infection and dissemination observed in wild boars and on earthworms. In the first report, using human volunteers, the disease was successfully transmitted to healthy volunteers.

**Equine Cutaneous Leishmaniasis**

Leishmaniasis is a zoonotic disease caused by the protozoan Leishmania donovani, which is transmitted by sand flies. Lesions are usually seen on the head, ears, nose, mouth, and extremities. The agent, a dimorphic protozoa, exists in two forms: the amastigote (intracellular), which is the infective stage, and the promastigote (extracellular), which is the form that initiates the infection. The disease is transmitted by sand flies, which bite the host and deposit the infective stage into the wound. The disease is most common in the Middle East, North Africa, and parts of Asia. There is no effective vaccine, and treatment is often difficult and time-consuming. The most common treatment is surgical excision, followed by 30-60 days of antimonial chemotherapy. The disease is often chronic and can result in significant disfigurement of the affected limb.

**DOS**

DOS has been repeatedly observed in horses and has been associated with a significant increase in levels of brain damage. This may be due to the high levels of DON in feed. The feeding of DON has been observed to cause significant reduction in brain function and a decrease in cognitive performance. However, the specific mechanisms by which DON causes these effects are not fully understood. The potential impact of DON on brain function is significant, and further research is needed to fully understand the implications of these findings.
In the US, horse owners should be aware of West Nile Virus (WNV), as recent cases have been reported. The virus, transmitted by mosquitoes, can cause disease and death in horses. A licensed WNV vaccine was available for horses in the US, with other equine vaccines being produced. As of today (early September), the first 2014 horse cases of WNV were diagnosed in Kentucky. The five-year-old mare developed neurological symptoms and was confirmed to have WNV. It is important for horse owners to recognize clinical signs and take steps to prevent disease. Surveillance is the basis for improving early detection and prevention.
State-of-the-Art Imaging Techniques

A state-of-the-art approach to imaging horses for musculoskeletal disease detection, equine imaging techniques can be broadly divided into four categories: radiography, ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI). These modalities are complementary to a clinical examination and provide detailed characterization of the anatomy. CT and MRI provide superior spatial resolution and contrast, making them particularly useful in the evaluation of musculoskeletal injuries. The ability to visualize soft tissues and bone, as well as pathologies within those tissues, makes these modalities invaluable in the diagnosis and management of musculoskeletal injuries.

Computed tomography (CT) provides excellent visualization of bone and soft tissue structures, allowing for the detection of fractures, osteomyelitis, and other osseous and soft tissue pathologies. MRI, on the other hand, excels in the evaluation of soft tissue injuries, providing high contrast resolution for the visualization of ligaments, tendons, muscles, and nerve sheaths. The combination of CT and MRI provides a comprehensive diagnostic picture, often referred to as a “multimodal approach.”

In summary, CT, MRI, and nuclear scintigraphy may be invaluable in the work-up of the equine athlete. MRI is increasingly utilized for musculoskeletal evaluation and has been shown to have superior diagnostic accuracy compared to other imaging modalities. It is particularly useful in the evaluation of tendons and ligaments, allowing for detection of subtle injuries such as tenosynovitis or ligament strain. Pet owners should be aware that the radiographic features of a musculoskeletal injury may not reflect the degree of associated soft tissue injury. Therefore, if no radiographic abnormality is detected, one can still consider the diagnosis of a musculoskeletal injury. In other words, a normal radiographic examination does not preclude the existence of a musculoskeletal injury! While MRI and CT are powerful diagnostic tools, the decision to utilize these imaging modalities should be made after a thorough history and physical examination. The overuse or misinterpretation of these advanced imaging modalities can lead to misdiagnoses or unnecessary treatments, which can be costly and time-consuming for both the pet owner and the veterinarian. A thorough understanding of the strengths and limitations of each imaging modality is essential for their appropriate utilization.

OCTavia is a 20-year-old, 1360-pound Warmblood mare that presented with a three-month history of right hind limb lameness. She was referred to our hospital for further evaluation. On physical examination, she had a Grade 3/5 right hind limb flexion, with marked improvement noted with manipulation of the stifle joint. She was not afebrile, and her white blood cell count was 17,200 with a neutrophilic leukocytosis. No other abnormalities were noted on physical examination. After a thorough diagnostic workup, the mare was started on strict stall rest, NSAIDs, and a combination of acupuncture and physical therapy. After three months of rest, the mare was reevaluated and was noted to have a significant improvement in lameness. The mare was then transitioned to a new minimally effective protocol that included a combination of oral and intra-articular medication, as well as physical therapy. The mare was reevaluated after three months of therapy and was noted to have a complete resolution of lameness. The mare was then gradually returned to full exercise and returned to competition. The mare was also started on a combination of oral and intra-articular medication, as well as physical therapy. The mare was reevaluated after three months of therapy and was noted to have a complete resolution of lameness. The mare was then gradually returned to full exercise and returned to competition.