EQUINE DISEASE QUARTERLY

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COMMENTARY

IN THIS ISSUE

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LLOYD'S

WHILE I WAS IN VETERINARY SCHOOL 20-some years ago, the first ultrasound machine was being "explored" by board-certified veterinary radiologists at university veterinary schools. Pain medication for horses was mostly limited to the non-steroidal anti-inflammatory drugs of phenylbutazone, flunixin meglumine, and dipyrone (no longer available). Other pain medications were riddled with side effects. Therapy for musculoskeletal injuries was hydrotherapy and rest or mild exercise.

We've come a long way.

In 2009, along with better pain medications and anesthetic agents, horses will have more access than ever to the same diagnostics as humans. More private veterinary clinics will offer computerized tomography (CT) and magnetic resonance imaging (MRI). Ultrasonography has advanced beyond reproductive and gastrointestinal use—ultrasound imaging of anything from eyes to tendons is now common. Gone are the days of sneaking dog and cat patients into a human hospital to get a CT or MRI done in the middle of the night—for complicated cases, this technology is offered at an increasing number of university and private veterinary hospitals for horses, pets, and other animals.

The array of equine therapeutic tools has also expanded beyond new antibiotics, effective pain medications, and safer anesthetic agents. Hyperbaric chambers are being used in several equine clinics across the country, and more research will likely be forthcoming on the benefits of this technology. Equine rehabilitation centers that offer underwater treadmills and swimming pools for horses are also gaining in popularity and use.

While this might sound pie-in-the-sky to those who don't know how (or if) the next load of hay will be paid for in this challenging economy, keeping a horse healthy is light-years beyond where equine medicine and surgery were a quarter-century ago. State-of-the-art diagnostic and therapeutic options may be expensive for many horse owners now, but within a few years will likely be affordable.

Cost, in any case, is relative. Horse owners might save money by obtaining an accurate diagnosis to allow veterinarians to start a specific treatment for their horse's ailment and to determine its prognosis. This may be more economical than investing in "let's treat it for three to four months and see if he responds to treatment."

Because of enhanced and collaborative disease reporting, we can read of equine disease outbreaks that occur anywhere from Australia to South Africa and know that surveillance is ongoing to help protect our horse population.

No matter what, it is exciting to see the development and marketing of new licensed vaccines and pharmaceuticals and to see a horse recover from a disease thought to be incurable.

At the end of the day, any horse wants and deserves the basics of a good life: health, good food and water, shelter, companionship, and a purpose to life.

Here's to a healthy 2009 for you and your horses.

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INTERNATIONAL

Third Quarter 2008

THE INTERNATIONAL Collating Centre, Newmarket, England, and other sources reported the following disease outbreaks.

Cases of Anasplasmosis (*Anasplasma phagocytophila*) and Borreliosis (*Borrelia burgdorferi*) were diagnosed among non-Thoroughbred horses in Switzerland. Contagious Equine Metritis was confirmed in two horses in France and a non-Thoroughbred stallion in Switzerland.

Two cases of Eastern Equine Encephalitis (EEE) were diagnosed among non-Thoroughbred horses in Ontario, Canada. The U.S. Department of Agriculture (USDA) reported 157 cases of EEE during 2008, with 81 in Florida and 22 in Georgia as of November 10.

Cases of equine herpesvirus (EHV) infection were reported from Ireland, South Africa, and the United Kingdom (UK). In Ireland, Coital Exanthema (EHV-3) was diagnosed in a pony stallion; EHV-1 was isolated from a Thoroughbred mare with neurological signs; and EHV-4 was isolated and identified by polymerase chain reaction (PCR) from an ataxic trotter mare. In the UK, one horse was euthanized due to severe neurological disease; serology utilizing Complement Fixation (CF) testing identified moderately high titers to EHV-1 and EHV-4. Several in-contact animals seroconverted to both viruses, although none of them exhibited respiratory or neurological signs. Respiratory disease attributable to EHV-4 was confirmed by serology in a single animal and a case of EHV-1 abortion was diagnosed in the UK. Ten abortions attributable to EHV-1 were diagnosed on four premises housing Thoroughbred and Warmblood mares in South Africa.

Equine Infectious Anemia was diagnosed in two non-Thoroughbred horses in France and three horses in Germany. Japan reported a single case of equine influenza in a draft horse on July 1, with no cases subsequently identified despite extensive surveillance. Equine influenza was confirmed on two premises in the UK. Influenza virus isolated in Switzerland during November 2007 has been characterized as a member of the Eurasian lineage of equine subtype-2 (H3N8).

Cases of piroplasmosis were reported in United Arab Emirates, South Africa, and Spain, where the disease is considered endemic. One case of piroplasmosis in a non-Thoroughbred horse was reported from Switzerland. A clinical case of piroplasmosis was confirmed during August in a 7-year-old Quarter horse in Florida, USA. Subsequent serological testing of 25 horses on the premise identified four additional positive animals. Testing of other in-contact and surrounding premises revealed 14 positive animals on six premises. Transmission of the infection is considered to have occurred as a result of needle transmission and not via tick vectors. All positive animals were linked to two horses that entered Florida from Mexico. As of November 5, six premises were under state quarantine awaiting repeat serological test results.

Strangles was reported on four premises in Denmark, five in France, 20 in Ireland, five in South Africa, several premises in Sweden, and four in Switzerland.

West Nile Virus (WNV) infection was diagnosed among two non-Thoroughbred horses in Ontario, Canada; two non-Thoroughbred horses in France; and 16 horses on 11 premises in Italy. As of November 10, the USDA reported 138 cases of WNV infection among horses in the United States during 2008, with 40 in Washington and 23 in California.

Equine Disease Quarterly

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NATIONAL

MRI Diagnostics

MAGNETIC RESONANCE IMAGING (MRI) is an imaging technique that uses magnetic fields to create various types of cross-sectional and three-dimensional images. While commonly used by physicians, MRI has only been used in equine clinical cases for the past decade and has come into widespread use just within the past five years. This modality provides superior soft tissue and bone detail, allows detection of abnormalities in an earlier state of disease, and is considered the gold standard in many cases.

Magnetic field strength is measured in Tesla (T). The strength of the magnetic field varies between types of magnets but is typically between 0.3 T and 1.5 T for most magnets currently in routine equine clinical use. Increased magnetic field strength means that examinations can be obtained with higher resolution in a shorter time. The strong magnetic field causes the molecules in the body to align slightly differently than they do while under only the influence of the earth's magnetic field. This influence allows us to manipulate the molecules using targeted electromagnetic gradients and radiofrequency pulses in various ways to gain more information about the tissues.

A typical MRI examination produces hundreds of individual images to be reviewed and usually takes between one and two hours to complete. Specific sequences are optimized to highlight regions of inflammation, changes in anatomical structure, or areas of chronic damage.

Magnetic resonance imaging is often used when other imaging modalities such as radiography, ultrasonography, or nuclear scintigraphy have failed to provide a specific diagnosis. These failures may be due to the fact that the changes are very subtle and cannot be diagnosed using these methods. Since an MRI examination can be time consuming and often requires general anesthesia, it is extremely important for the area of interest to be identified as specifically as possible, as it is not feasible to examine an entire limb. In lameness cases, a thorough lameness examination to localize the problem is essential.

Magnetic resonance imaging is not without limitations. Many systems require general anesthesia, and examinations can be expensive. The design of current equipment restricts the size of body regions that can be accommodated to the bore of the magnet. These limits can vary from the limbs distal to and including the carpus or tarsus and the head, to the level of the second cervical vertebra in most adult horses, to an entire foal (less than 500 lbs). Images of ponies are often limited to the feet, fetlocks, and head due to their short legs.

Navicular disease has long been classified as a group of clinical signs and typical responses to diagnostic local anesthesia. Using MRI, navicular cases actually are seen to have a diverse group of problems including lesions of the deep digital flexor tendon, inflammation or sclerosis of the navicular bone, or inflammation of the supporting ligaments of the navicular bone. The optimal treatment for each of these problems is not the same, so MRI allows therapy to be tailored to the specific disease process.

Imaging of the brain is essentially impossible without MRI or computed tomography. Since the brain is a soft tissue structure encased in a bony housing, ultrasound waves are unable to penetrate the bone, and radiography is insensitive to soft-tissue problems. By using MRI, we have been able to find mass lesions, hemorrhage, infection, and inflammation in the brain and make recommendations accordingly.

The upper airway is another region in which MRI has enabled us to refine our diagnoses prior to medical or surgical treatment. Masses or fluid within the sinus cavities appear very similar on radiographs, even if the disease processes have different etiologies, treatments, and prognoses. The ability to differentiate a tooth root abscess from primary sinusitis, an ethmoid hematoma, or a sinonasal cyst changes the approach to the case and a more targeted method can be used.

Magnetic resonance imaging is an exciting, rapidly evolving sector of equine medicine. As advances in technology and knowledge continue, we will hopefully continue to refine our diagnostic abilities.

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KENTUCKY

The Racetrack: A Changing Perspective

RECENTLY A VETERINARY colleague remarked that a horse that had sustained a minor laceration in the starting gate had been scratched. While there was no expectation that the horse's performance would be impacted, she could not justify permitting an injured horse to race. If the same incident had occurred several years earlier, it is unlikely she would have recommended the scratch. This incident illustrates a philosophical shift that has occurred in horse racing and the resulting requirement that we defend why a horse races rather than why it doesn't.

Subtly and over time, a critical question for this industry has evolved from "can a horse race with a medical condition?" to "should a horse race with a medical condition?" The next question looming on the horizon is "should a horse race that has had a medical condition in the past?" The ground is shifting beneath our feet as we as veterinarians and the horse racing industry try to answer these questions to the satisfaction of the public and personal conscience.

Veterinary medical progress has enhanced our diagnostic capabilities in the detection of minor injuries and has afforded recovery from numerous major injuries previously considered life-threatening. Factor in our understanding of the cumulative nature of catastrophic injuries—that these injuries develop over time and perhaps without any clinical signs—and it becomes difficult to know with any degree of certainty what the responsible course is. Will an argument be put forth that if a horse has been injured in any capacity it should never race again?

Some horses sustain injuries, recover, and return to competition; others don't. Of the horses that return to competition, some compete successfully; some don't. But what of the horses not injured? Some compete successfully; some don't. They are all individuals, and they respond best when treated that way. Thoughtful, ethical, responsible decisions on a case-by-case basis should be the standard.

When I first started working as a racetrack regulatory veterinarian, "racing soundness" was defined as the ability of a horse to complete a race. This was a difficult concept, as racing soundness could not be identified until after a race. Raised eyebrows at the pre-race exam were typically met with the trainer's exhortation, "Don't worry, Doc. This horse'll win." And even when the winner did limp into the Winner's Circle, the horse had just proved its ability to compete successfully and retained its classification as "racing sound." Racing soundness was associated with the ability of a horse to perform to expectations rather than with the actual health or welfare of the animal. Risk management was directed at the bettor and not the horse.

Times have clearly changed. The definition of racing soundness is now predicated on equine health, safety, and welfare. The health of horse racing is directly tied to the health of the horses. Every industry stakeholder has an incentive to identify and engage in practices that promote responsible stewardship of the racehorse. The industry has been engaged in some critical self-evaluation, and change is being embraced. The traditions of racing have collided with the frontiers of science, and the horse is the ultimate beneficiary.

Many changes in horse racing have occurred in the last 20 years—much of which I could not have foreseen, but little that I regret. The challenges facing this industry are as great as the opportunities. I do know that my decision to be a part of this grand sport was, pardon the pun, a sound one.

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Animal Disposal

WHILE CARCASS DISPOSAL is not a pleasant topic, it is a subject of significant economic and environmental concerns. What are options of carcass disposal?

In many instances the cause of death needs to be determined, so the body is transported to a diagnostic laboratory for a necropsy examination. Alternatively, the animal may be necropsied on the farm by a veterinarian and samples shipped to the laboratory. Other times, the animal may simply need disposal.

Most states have statutes and regulations governing animal disposal. Some areas have rendering or hauling services that will come to the farm to remove the animal. Carcasses picked up for rendering are usually processed to yield a product and may be converted into fertilizer or even biofuels.

In Kentucky, burial on the farm is permitted. By regulation, the burial must be within 48 hours after the carcass is found. The site of burial must never be covered with the overflow of ponds or streams and must not be within 100 feet of any waterway, sinkhole, well, spring, public highway, residence, or stable. The body must be placed at least four feet deep in the earth, with the thoracic and abdominal cavities incised. The body is then covered with at least two inches of lime and three feet of dirt. In addition to burial on the farm, animal remains may also be disposed of in approved landfills and composting facilities.

The remains of animals taken to a diagnostic laboratory also have to have proper disposal. Several options are used by laboratories. Rendering is one of the main ways of disposal, since it can accommodate a large volume of material and is economical. However, recently rendering has become more regulated and restricted, primarily due to concerns over bovine spongiform encephalopathy (BSE). While currently a good method of disposal, rendering as a viable, long-term means is uncertain.

A primary alternative to rendering is incineration or cremation. This method is expensive but ensures that infective or potentially dangerous material is destroyed. Individual animals can be cremated and the ashes returned to the owner for burial, or incineration can be employed with multiple carcasses simultaneously.

A new methodology is tissue digestion by alkaline hydrolysis. Alkaline hydrolysis is a simple, natural process by which the body's complex molecules are broken down to simple components by exposure to a strong base (high pH) under elevated temperature and pressure. This process occurs in nature when animals are buried in alkaline or neutral pH soil. With this method, the carcass is converted to a sterile soluble solution in a tissue digester and a residue consisting of the inorganic component (ash) of the bones. Tissue digesters can be rather large, up to a capacity of 10,000 pounds, allowing for disposal of large amounts of animal tissue. An added benefit is that infective prions associated with BSE, scrapie in sheep, or chronic wasting disease in deer are inactivated by alkaline hydrolysis. This technology will likely become more widely used in the future.

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Hyperbaric Oxygen Therapy

HYPERBARIC OXYGEN (HBO) is a high-dose oxygen inhalation therapy that is achieved by having the patient breathe 100% oxygen inside a pressurized hyperbaric chamber. The delivery of oxygen to the tissues is through respiration because the patient absorbs insufficient oxygen through the skin.

Oxygen is transported by the blood from the lungs into the tissue by two methods: it is bound to hemoglobin in red blood cells, and it is physically dissolved in the plasma. As the chamber is pressurized, the elevated alveolar oxygen tension in the lungs drives oxygen into the plasma, which is then transported throughout the body. Oxygen transport by plasma is the key to hyperbaric oxygen therapy, for even tissue with a poor blood supply can receive oxygen as the hyperoxygenated plasma seeps across it.

While increasing tissue-oxygen levels is a primary therapeutic effect of HBO, other benefits include reducing edema, modifying growth factors and cytokine effects, stimulating more rapid development of capillary budding and granulation tissue formation within the wound bed, promoting cellular proliferation, accelerating collagen deposition, and increasing microbial oxidative killing.

Damaged tissue can have decreased oxygen levels that reduce the activity of several antibiotics, including aminoglycosides, sulfonamides, and fluoroquinolones. By raising the oxygen in ischemic tissue to normal levels, HBO may normalize the activity of these antimicrobials. Additionally, HBO may potentiate the activity of certain antimicrobials by inhibiting biosynthetic reactions in bacteria. HBO can modulate the immune system response and also enhance oxygen-radical scavengers, thereby decreasing ischemia-reperfusion injury.

Although any therapeutic application of hyperbaric oxygenation is intrinsically associated with the potential for producing mild-to-severe side effects, the appropriate use of hyperoxia is one of the safest therapeutics available to the practitioner.

It is unknown if hyperbaric oxygen therapy (HBOT) will cause congenital defects in horses. In human studies it has not been shown to have adverse effects. In our hyperbaric center, we do not hesitate to treat a mare with HBOT, especially when the benefits outweigh the risks. It is not unusual in our clinic, if treating a foal, to allow the mare in the chamber during treatments to aid in the relaxation of the foal.

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