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LLOYD'S

COMMENTARY

"Knowing that forewarned is forearmed."
Abraham Tucker 1768 in *The Light of Nature Pursued*

Just today (early September), the first 2014 equine case of West Nile Virus (WNV) encephalitis was confirmed in Kentucky. The five-year old horse was euthanized after advanced neurological symptoms developed. She had no history of being vaccinated for WNV.

The cost of euthanasia and disposal was much more than any WNV vaccine.

And yet the same story happens year after year, not only in Kentucky, but around the country with a disease for which there are safe, efficacious vaccines.

West Nile Virus was first discovered in 1937 in Africa, but prior to 1999, few Americans had any reason to know about it since it was a foreign animal disease. No one worried about it. After all, it was an ocean away and someone else's problem … until the first cases were diagnosed in New York.

When it became obvious that the mosquito-transmitted disease was spreading across the US causing disease and deaths in horses, researchers utilized available information to start the wheels turning toward disease prevention. By 2001 a licensed WNV vaccine was available for horses in the US, with other equine vaccines being produced subsequently. To date, no human WNV vaccine is licensed in the US, despite annual human cases since 1999. In 2013, 2,469 human cases of WNV were reported in the US, according to the US Centers for Disease Control and Prevention.

The diseases pythiosis and leishmaniasis might be new to readers of this issue of the *Quarterly*, however equine cases of both diseases have been diagnosed in the US. Just because a disease is rare in a state or country doesn't mean horse owners shouldn't be aware and vigilant, just like WNV taught us. The world is a small place, considering the rapid national and global transportation of horses for competition, breeding, and sales.

Horse owners recognizing clinical signs and calling a veterinarian is the backbone of all disease surveillance. Research is the basis for improving disease diagnosis, treatment, and prevention.

Prior to Spring 2014, North Americans likely only knew about Ebola virus from reading Richard Preston's book *The Hot Zone*, popular in the 1990s. This disease takes on new meaning when the nightly news shows affected people in Western Africa suffering and dying from this outbreak.

And, while horses are not affected with Ebola virus, who would have thought that a tobacco plant would be involved in the production of a serum that might be able to treat this deadly disease? Before this outbreak, such research would likely have been considered a waste of money, but now we can all hope that further research into treatment and prevention can rapidly progress to stop this tragedy.

It is tempting to ignore information and research into uncommon or so-called exotic diseases that have no immediate impact on our own horses without taking into account the indisputable fact that someone else's problem today can become our problem tomorrow.

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INTERNATIONAL

Second Quarter 2014*

The International Collating Centre, Newmarket, United Kingdom (UK), and other sources reported the following disease outbreaks.

During the period under review, two cases of African horse sickness were recorded in South Africa, in the protection/surveillance zone in the Western Cape.

Reoccurrence of vesicular stomatitis was confirmed in Texas, USA on May 23. Infection with the New Jersey serotype was identified on seven premises located in four counties in Texas, all in equines.

Denmark, France, Germany, Switzerland, UK, and USA recorded strangles. Outbreaks involving horses at two riding stables were reported by Denmark. The number of outbreaks in other affected countries included 13 in France, five in Germany, two in Switzerland, two in the UK, and numerous outbreaks in the USA involving 15 states.

Influenza was reported by France (two outbreaks) and the USA (one outbreak in Texas).

Equine herpesvirus-1 and -4 (EHV-1, -4) related diseases were recorded in Argentina, France, Germany, Japan, the UK, and the USA. Respiratory disease caused by EHV-1 was confirmed in France (nine outbreaks), Germany (isolated cases on five premises), the UK (three outbreaks involving limited numbers of animals, two of which were co-infected with strangles), and the USA in numerous states.

Argentina, France, Germany, Japan, the UK, and the USA reported cases of EHV-1 abortion or death in neonatal foals. The number of cases/outbreaks varied from one in Argentina to five outbreaks in France, to a single case of abortion and a neonatal foal death in Germany, to one foal death in Japan, to three isolated cases on individual premises in the UK, and seven cases in Kentucky, USA.

EHV-1 related neurologic disease was confirmed in France (one outbreak) and the USA (10 outbreaks in eight states), the majority representing single cases of the disease caused by non-neuropathogenic strains of the virus.

Isolated cases of EHV-4 respiratory disease were reported in Germany (five) and the UK (four).

A limited number of cases of infection with EHV-2 and EHV-5 and one case of equine adenovirus infection were reported in the USA.

Canada and the USA recorded equine infectious anemia (EIA): 26 cases on 10 premises in Saskatchewan Province, Canada, and isolated cases in California and Wyoming, USA.

Equine piroplasmosis was reported by France (endemic), United Arab Emirates (endemic), and the USA. Cases of infection with *Theileria equi* were identified in California, Florida, and Texas, all in Quarter Horse racehorses involved in non-sanctioned racing, some of which were also infected with EIA virus. The vast majority of cases were in imported horses.

Germany reported contagious equine metritis on 10 premises in 11 non-Thoroughbreds (five culture-positive stallions and six mares).

Two cases of equine coital exanthema (EHV-3) were diagnosed in Kentucky, USA.

France and Germany each reported detection of equine arteritis virus infection in a carrier stallion. One case of nocardioform placentitis and abortion was diagnosed in Kentucky, USA.

Single cases of salmonellosis were reported in Germany and Switzerland. A limited number of outbreaks were recorded in the USA with seven cases of Group B salmonellae and two cases involving Group C1 strains.

The USA reported isolated cases of clostridial enteritis associated with infection with *Clostridium difficile* Toxin A gene and Toxin B gene. In addition, cases of *C. perfringens* Type A enterotoxemia were confirmed.

The USA reported 13 cases of Eastern equine encephalomyelitis, the vast majority in Florida. One equine case of West Nile Virus encephalitis was documented in Alabama.

One case of Hendra virus infection was confirmed in Queensland, Australia.

The USA recorded multiple outbreaks of rhodococcal disease throughout the country. Single cases of equine anaplasmosis were confirmed in Germany and Switzerland, and an isolated case of tetanus was reported by Japan.

**First Quarter Report from Australia*

Equine Disease Quarterly

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Equine Pythiosis

The triad of warm temperatures, flooded lands, and aquatic vegetation highly favors the proliferation and maintenance of *Pythium insidiosum*, a pathogen of plants and, occasionally, mammals and birds. The disease, named pythiosis, has worldwide distribution in horses and has been known by different names according to geographical location: "bursatte" in India, "leeches" and "swamp cancer" in Australia and the US, and "ferida da moda" in Brazil.

In horses, the agent causes ulcerative, granulomatous lesions mainly in the cutaneous and subcutaneous tissues. *P. insidiosum* also causes gastrointestinal, ocular, and disseminated forms of the disease in other animals.

In horses, skin lesions are more frequent in the limbs, chest and abdomen, parts which are in direct contact with water containing zoospores (the infective stage) of *P. insidiosum*. It is hypothesized that the zoospores are not able to penetrate the intact skin, but a small lesion such a mosquito bite is enough to allow entry. An association between lesion locations and areas of insect blood feeding has been demonstrated in horses.

While the pathogenesis of pythiosis is not fully understood, after an incubation time of 15-20 days, horses typically develop granulomatous, ulcerative lesions, marked by fistulas draining serosanguinous (blood and serous fluid) exudate. Lesions also contain firm and necrotic-gray material referred as "kunkers." These kunkers contain viable hyphae (microscopic structures) that are important for differentiating the disease from equine sarcoid, squamous cell carcinoma, granulation tissue, and other lesions.

Pythiosis is not contagious. However, animals showing chronic debilitating disease might contribute to the life cycle of the pathogen during the drought by constantly expelling kunkers in the environment. Recently, *P. insidiosum* DNA has been detected from moist soil environments where the disease is endemic for humans.

Predisposing factors are not clear, but horses standing in ponds or flooded areas have an increased risk of contact with the agent. The epidemiology of the disease has been studied in the Brazilian Pantanal, which is considered the most endemic area of equine pythiosis in the world, with an average prevalence of five percent. The number of cases significantly increases in the rainy period, which is the summer in Brazil, highly favoring the development of the agent in the environment.

An early diagnosis of pythiosis is directly linked with favorable outcomes, mainly because treatment relies on the combination of radical surgical removal of affected tissues, chemotherapy, and immunotherapy. However, prevention is difficult. Neither the disease nor the immunotherapy triggers long-term protective antibodies. Hence, management of the animals should include avoiding wetland environments in warm seasons and close attention to difficult-to-treat, fast-growing wounds with a serosanguineous discharge.

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NATIONAL

Current Thoughts on the Significance of Mycotoxins

Mycotoxins are toxic metabolites produced by molds (fungi). Our understanding of the economic significance of feed-borne mycotoxins has often paralleled advances in analytical methodology used for measuring mycotoxin levels on feedstuffs.

Aflatoxin is a mycotoxin produced mainly by the molds *Aspergillus flavus* and *Aspergillus parasiticus,* which are generally considered to be tropical or semi-tropical fungi thriving under conditions of high temperature and humidity. Four chemical forms of aflatoxin can be measured simultaneously by many commercial laboratories. Horses, like many other species, are very sensitive to feed-borne aflatoxins. Aflatoxins mainly target the liver, causing necrosis and potentially cancer.

More common on a global basis, however, are several hundred identified *Fusarium* mycotoxins. The study of *Fusarium* mycotoxicoses is considerably more complex than the study of aflatoxicosis. *Fusarium* fungi thrive in soils from areas with temperate climates including North America, much of Europe and Asia and South America. The most common *Fusarium* mycotoxins include DON (also known by the chemical name deoxynivalenol or the common name vomitoxin), zearalenone, fumonisin, and fusaric acid.

The feeding of blends of grains naturally contaminated with *Fusarium* mycotoxins, largely

DON, has been reported to cause reduced concentrate consumption by sedentary mares with some evidence of liver damage also detected. Imposition of an exercise regime, however, resulted in increased concentrate consumption but weight loss then also was seen.

Horses are particularly sensitive to feed-borne fumonisin, which can cause mortalities due to equine leukoencephalomalacia. This brain disease is also more commonly known as "moldy corn poisoning."

The most significant current controversy regarding feed-borne mycotoxins is the concept of conjugated or "masked" mycotoxins. These are mycotoxins that are produced by molds on feedstuffs preharvest and then chemically modified by the plants invaded by the molds. These modified mycotoxins are thought to be toxic, but non-detectable by analytical techniques currently used by most commercial laboratories. Utilizing research methods, scientists are actively studying these compounds in order to understand their importance.

It appears that the frequency of mycotoxin contamination of feedstuffs is increasing. This may be due, in part, to unfavorable growing conditions caused by extreme weather. In North America, 2012 was a year of significant drought in corn-growing regions. The levels of fumonisin contamination were unusually high and fumonisin was detected in significant quantities in corn grown in regions where fumonisin contamination has been rare in the past.

Improved analytical techniques for mycotoxin detection are needed to minimize exposure of horses to contaminated feeds and forages in the future.

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Equine Cutaneous Leishmaniasis

Leishmaniasis is a zoonotic disease caused by the obligate intracellular protozoal parasite of the genus *Leishmania*. There are more than 30 known species of *Leishmania* that vary with region. The protozoa are endemic in many tropical and subtropical regions in both the Eastern and Western hemispheres, where it is well described in people and dogs. *Leishmania* infections in humans can result in cutaneous, mucocutaneous, or visceral (organ) lesions. Visceral leishmaniasis is the second leading parasitic cause of death worldwide. Signs include fever, anemia, diarrhea, darkening of the skin, spleen and liver enlargement, and lymphadenopathy.

Dogs are the most commonly affected domestic species and may act as a reservoir for disease. Canines can have visceral, ocular, and cutaneous lesions. In endemic areas all breeds of dogs are affected, while in the United States this disease has been most significant in the foxhound population.

Cutaneous leishmaniasis has been documented in horses around the world. Lesions are most commonly observed as nodules on the head, external ear, scrotum, legs, and neck. These nodules can ulcerate and are often mistaken for aural plaques or sarcoids. Visceral lesions have not been widely reported in the horse.

L. infantum has been reported as the causative agent of cutaneous leishmaniasis in horses in Germany, Spain, and Portugal. Recently a report from central Europe identified *L. siamensis* (a species previously reported as a cause of visceral human leishmaniasis) in four horses. In South America, *L. braziliensis* has been identified as the causative organism in horses. Leishmaniasis has been recognized sporadically in the United States, primarily in horses with a history of international transportation. Recently, however, two horses in Florida were diagnosed with cutaneous leishmaniasis due to *L. siamensis*.

In all mammalian species affected with leishmaniasis, the mode of transmission is believed to be by various species of sand flies. In the Eastern Hemisphere, these are *Phlebotomus* spp, while *Lutzomyia* spp are predominant in the Western Hemisphere. The protozoa are transmitted by the female sand fly bite during salivation that occurs during blood feeding.

Diagnosis of cutaneous leishmaniasis in horses is often made by impression smear or biopsy of the lesion with protozoa identified within macrophages. Polymerase chain reaction (PCR) and sequence analysis can be used to confirm the diagnosis and identify the species. PCR targeting the internal transcriber spacer 1 (ITS1) is most sensitive.

Lesions in horses are often self-limiting, but several treatments have been used, including surgical excision and medications such as amphotericin, fluconazole, and pentavalent antimony compounds. The pentavalent antimony compounds (sodium stibogluconate or meglumine antimoniate) are the standard treatment for people and have been used in horses, but these drugs have potentially serious side effects and are not available in the United States. As lesions often spontaneously regress, it is difficult to determine the efficacy of any described treatment.

With increasing international transportation of horses, leishmaniasis should be considered in any horse with cutaneous nodules. While the disease is not fatal to horses, they can be infected with species of *Leishmania* that are capable of transmission to humans.

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State-of-the-Art Imaging Techniques

An appropriate treatment plan for rehabilitation and recovery post-musculoskeletal injury is built upon the foundations of an accurate diagnosis and detailed characterization of the pathology. Radiography and ultrasonography are the cornerstones of the evaluation, but can fall short in the assessment of some conditions. Advanced modalities such as computed tomography (CT), magnetic resonance imaging (MRI), and nuclear scintigraphy may be beneficial in select cases.

Computed tomography usually requires the horse be placed under general anesthesia to prevent movement. Areas that can be imaged include the distal limbs (from the carpus or tarsus down to the hoof) and the head. This imaging modality is best suited for evaluating bone as it provides excellent osseous detail, but can also be useful for assessing soft tissues. Common indications for CT in horses include the characterization of distal limb fractures and paranasal sinus disease related to ethmoidal hematoma, cysts, neoplasia, or dental issues.

Contrast enhancement with CT is another technique that can further differentiate normal versus abnormal areas within soft tissues. With this method, iodine-based contrast media is injected intravenously and can help enhance visualization of pathology. Computerized three-dimensional models can also be generated from a study, which further aids in conceptualizing damaged tissues. An exciting improvement to this technology, which currently has very limited availability, is a standing CT system for imaging horses without the need for general anesthesia.

Magnetic resonance imaging systems vary from standing low-field strength units that are used to image the horse under sedation to more powerful high-field units that require general anesthesia. Because of the unit configuration, areas that can be imaged in horses are limited to the distal limbs (carpus/tarsus or below) and head. Similar to CT, MRI generates multiple two-dimensional cross-sectional image slices produced using a variety of sequences that uniquely highlight different tissues such as bone, tendon, cartilage, and synovium. 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 can provide unique information about various bone injuries. The utilization of MRI has transformed our understanding of injuries to the distal limbs of horses and can be invaluable in the work-up of the equine athlete.

Another useful imaging technique is nuclear scintigraphy, which can highlight differences in vascular (blood flow) patterns, soft tissue inflammation, and active bone modeling. Abnormal bone modeling can occur because of localized injury (bone bruises, stress fractures), degenerative changes (bone spavin,

MRI of horse skull showing a brain tumor (cholesteatoma)
Image courtesy of Auburn University College of Veterinary Medicine

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ringbone), excessive stress on certain areas (pedal osteitis), or inflammation and infection. These conditions can be apparent by scintigraphy well before radiographic changes are visible. Scintigraphy also has proven useful in the diagnosis or characterization of acute suspensory desmitis, sacroiliac injuries, soft tissue and osseous conditions of the foot and navicular region, cervical spine osteoarthritis, overriding thoracolumbar spinous processes (kissing spines), bone spavin, stifle injuries, pelvic fractures, radial fractures, high and low ringbone, subchondral bone cysts, and even dental disease.

In summary, CT, MRI, and nuclear scintigraphy continue to be valuable diagnostic tools that are becoming more widely available to equine patients. These modalities are complementary to a clinical examination and diagnostic analgesia, radiography, and ultrasonography in the diagnosis and characterization of musculoskeletal pathology in the horse.

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