EQUINE DISEASE QUARTERLY

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COMMENTARY

IN THIS ISSUE

When an equine patient needs to be hospitalized we expect the best care possible. Yet, just like human hospitals there are unique challenges in keeping the patient safe and healthy. One of these issues is hospital-acquired infections. It is estimated that 5% of patients in human hospitals will experience a healthcare-associated infection. We assume that similar rates occur in equine hospital settings.

There are a few key issues to remember. Opportunistic microorganisms (bacteria, fungi, and viruses) can affect the hospitalized horse. Many of these "bugs" can be carried by one hospitalized patient and not cause illness in that patient but can be shed into the housing environment, contaminating diagnostic or treatment equipment and other materials. Also, some animals might be incubating an infectious disease and shedding into the environment prior to actually having clinical signs. This emphasizes the need for routine cleaning, disinfection, and good hand hygiene in all areas of equine hospitals.

Secondly, despite our best efforts some hospital-acquired infections occur. Equine hospitals are different than human hospitals. We have hay, dust, and stalls made of wood and concrete. Our equine patient is large (1,200 lb. or more) with thick hair coats and produce 50 pounds of manure and urine per day. Infection control is a challenge even in human hospitals where almost every surface is easily cleaned and disinfected. Hospital-acquired infections are a risk whenever horses are hospitalized. Some equine patients may have a compromised immune system and are more at risk for opportunistic infections. As such, veterinarians need to discuss these potential risks for any hospitalized horses to their clients. Often owners of hospitalized horses receive admission and discharge information about the potential for hospital-associated infections.

Also, consider the sophisticated and intensive procedures we can now perform on horses. These include long-term intravenous therapy, oxygen support, and mechanical ventilation as some of the advanced therapies available for critically ill patients. The longer a patient is hospitalized the greater the potential to acquire an opportunistic infection.

Hospital infections can be costly. In a recent survey, 31 of 38 veterinary teaching hospitals reported an outbreak in the five years prior to the survey. Some of these outbreaks were in equine facilities resulting in hospital closure. As such, most equine hospitals will have procedures in place to reduce the likelihood of environmental contamination and follow strict isolation and quarantine procedures. We need to respect these policies which may impact a client's ability to visit the hospital and their animal. Owners should refrain from interacting with other hospitalized horses and recognize that their clothes, hands, and boots can transport potential pathogens to the hospital environment and to other horses. Owners may be asked to put on protective coveralls, shoe covers, and gloves prior to visiting their hospitalized animal as a biosecurity protocol.

Overall, hospital-acquired infections can be reduced by recognizing the risk, having appropriate cleaning and disinfection protocols, and practicing good hand hygiene. Clients need to recognize these risks and in addition, take measures to improve their own farm biosecurity to limit pathogen spread.

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INTERNATIONAL

Fourth Quarter Report 2014*

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

Outbreaks of African horse sickness were reported in four provinces in South Africa in which the disease is considered endemic.

The USA recorded continued vesicular stomatitis activity, all involving the New Jersey serotype of the virus. The disease was confirmed on an additional 68 premises including 60 in Colorado, seven in Texas, and one in Nebraska. In 2014, 17 counties were affected in Colorado, 13 in Texas and one in Nebraska, with infection confirmed in 584 equines and 60 bovines on 433 premises.

France, Germany, Ireland, Switzerland, and the USA recorded outbreaks of strangles. A total of 23 outbreaks were confirmed in 18 regions in France. Isolated cases were reported in three regions in Germany; Ireland confirmed 14 cases between the provinces of Leinster and Munster. Two outbreaks were recorded in Switzerland, one involving 50 of 100 at-risk horses. The disease is endemic in the USA with 41 cases confirmed on 22 premises in seven states.

Equine influenza outbreaks were reported by France, the UK and the USA. France confirmed four outbreaks. Some 18 outbreaks were confirmed in 15 counties in the UK (horses, ponies and donkeys), many involving unvaccinated animals. Endemic in the USA, outbreaks were recorded in Florida, Kentucky, Oregon, and Washington.

Equine herpesvirus (EHV)-1 related diseases were reported by France, Germany, Japan, South Africa, Switzerland, the UK and the USA. Respiratory disease was confirmed in France (six outbreaks), Germany (two outbreaks), Switzerland (one case), the UK (three outbreaks all involving donkeys) and the USA. Cases of abortion were diagnosed in Japan (isolated cases on five premises, all in vaccinated Thoroughbreds), South Africa (one case) and the USA (two cases). One outbreak of EHV-1 myeloencephalopathy involving two horses was confirmed in Idaho, USA. Outbreaks of EHV-4 respiratory disease were reported by France (11 outbreaks in five regions), Germany (single cases on two premises), and the UK (one outbreak involving three Thoroughbred yearlings). Multiple cases of EHV-2 and -5 infections were confirmed in Texas and Kentucky in the USA.

Germany confirmed persistent equine arteritis virus infection in one stallion and Switzerland reported one case of this infection.

Equine infectious anemia was diagnosed in France (one Friesian) and the USA (one Quarter Horse racehorse).

Equine piroplasmosis was reported as endemic in France and the United Arab Emirates.

A case of leptospiral abortion was diagnosed in a Thoroughbred mare in France. The USA recorded two cases of nocardioform placentitis and abortion.

Salmonella abortus equi infection was reported by Singapore in five non-Thoroughbred male horses on the same premises; they were part of a performance circus group. Ireland confirmed three outbreaks of salmonellosis on separate premises, and Switzerland recorded one case of salmonellosis (*S. enteritidis*).

The USA confirmed several cases of clostridial enteritis due to *C. perfringens* type A, and of equine proliferative enteropathy in foals.

Eastern equine encephalomyelitis was reported by the USA, with 25 out of an annual total of 139 cases diagnosed in the fourth quarter of 2014. The majority of cases were in Florida, Louisiana, New York, and North Carolina.

The USA confirmed 74 cases of West Nile encephalitis out of an estimated annual total of 140. Texas, Oklahoma, California and Missouri had the highest numbers of cases.

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

Japan recorded single cases of tetanus on two premises.

An outbreak of Getah virus infection was confirmed in a group of horses at a training center in Japan. The disease, which was diagnosed in 25 out of 49 febrile horses, was not life-threatening.

Rhodococcal disease was reported as endemic in the USA. Switzerland recorded one case of borreliosis in a horse with anemia that was successfully treated.

**Third Quarter Report for Australia*

Equine Disease Quarterly

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Global Horse Transportation Issues

The number of high-value insured horses travelling internationally is difficult to quantify, making true "risk assessment" for insurance purposes a problematic exercise. A record number of 1,003 United Kingdom-based Thoroughbred racehorses competed internationally in 2014. They travelled to France (417), Ireland (249), Dubai (144), Channel Islands (75), USA (34), Germany (22), Australia (15), Turkey (12), Switzerland (9), Canada (7), Sweden (7), Hong Kong (5), Italy (2), Singapore (2), Czech Republic (1), Japan (1), and Spain (1). There were 350 FEI international events in 1996 and this number grew progressively to 657 in 1999, 1,530 in 2006, and 3,215 by 2011. Stallions shuttle between both Northern and Southern hemispheres. Equine transportation data for other equestrian disciplines and horse-related activities are much less well documented, but long distance transport occurs within national frontiers, as in the USA, within Japan and Australia.

Long-distance travel has its own potential complications for horses. Confinement in a lorry or in an airframe does not provide immunity from all the problems that can occur in the normal day-to-day lives of horses. Possible injury, colic, and disease are ever-present and are arguably increased as hazards when these "creatures of habit" are exposed to unfamiliar circumstances and travelling companions. Quarantine and isolation, although always advocated, are not observed consistently, unless they are mandatory, as in the case of international travel. However, there are no guarantees. Even measures imposed by the animal health authorities in Japan and Australia failed to prevent the introduction of equine influenza into Australia in 2007.

However, the principal problem associated with long-distance transport is the combination of pleurisy and pneumonia that is known colloquially to horsemen everywhere as "shipping fever." This condition creates a potentially problematic differential diagnosis for the attending equine clinician, who has to decide, often in the absence of sophisticated diagnostics, whether a post-arrival fever is a treatable shipping fever or a potentially imported exotic disease. Reports of the incidence of shipping fever demonstrate the magnitude of this problem. Between 11 and 12% of U.S. imported horses that arrived into either New York or Los Angeles were febrile on arrival, and 60% of horse flights into Hong Kong had at least one case of shipping fever that was evident on arrival.

Advances in diagnostics, increased awareness, and better therapy mean that the majority of these shipping fever cases make an uneventful recovery provided treatment is initiated promptly. Delay can be fatal and the earlier the diagnosis is made and treatment is initiated, the more likely a successful outcome. Prompt identification is facilitated by the provision of veterinary services provided by experienced equine clinicians, in flight or at intermediate stops in long-haul road transport. Veterinarians do not accompany all high-value shipments. It is in insurers' best interests to insist that they do so.

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Re-emergent Diseases

The terms "emergent" and "re-emergent" frequently are used interchangeably without apparent appreciation of the meaning of each term as a descriptor of a specific infectious disease. It is important to make a distinction between the terms insofar as they are not synonymous. "Emergent" refers to the first recorded appearance and recognition of a disease in a population for which there are no previous published reports. "Re-emergent" diseases, on the other hand, are those that have been experienced in the past but either have reappeared in a more virulent form or have occurred in a different epidemiological setting.

A wide range of factors involving infectious agent, host, or the environment can contribute to the occurrence of an emergent or re-emergent disease. These can include: microbial change and adaption, host susceptibility to infection, modulation of climate, altered ecosystems, population demographics, trends in international trade and

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land use. The number of emergent and re-emergent diseases of humans, animals, and plants continues to increase as more sophisticated technologies become available that enable detection of previously undiscovered infectious agents in the host and the environment.

There are various examples of re-emergent diseases, some of which are host restricted to members of the family *Equidae*, whereas others can infect different domestic and/or wildlife species besides the horse. The majority of the better-known examples are viral diseases. The emergence of a strain of equine influenza virus, influenza-A/equine/Jilin/89 (H3N8), in China in 1989 gave rise to very high morbidity and associated case-fatality rates in the equine population exposed to this particular strain of virus. Very fortunately, the Jilin/89 strain of H3N8 virus did not spread outside of China.

Other examples that qualify as re-emergent were the outbreaks of Venezuelan equine encephalomyelitis caused by subtype 1E strains of the virus that occurred in Chiapas and Oaxaca states in Mexico in 1993 and 1996. Both disease events were associated with unprecedented clinical-attack rates and moderate case-fatality rates. Prior to these occurrences, subtype 1E strains of the virus were not known to cause significant disease and losses in horses.

The most widely known re-emergent disease of horses is equine herpesvirus-1 myeloencephalopathy. The occurrence of more virulent strains of the virus has been responsible for major outbreaks of disease especially over the past 15 years, both in Europe and North America. Enhanced neuropathogenicity is largely associated with a single point mutation in the catalytic subunit of the viral polymerase gene. Infection with these strains of virus has on occasion resulted in significant clinical disease and a high mortality rate.

As previously mentioned, diseases are also regarded as re-emergent if they occur in a different epidemiologic setting. Examples of two diseases that meet this criterion and which are of particular relevance to the horse include West Nile encephalitis and equine encephalosis.

West Nile virus, first discovered in the USA in 1999, has been responsible for significant annual losses in unvaccinated horses. Confirmation of equine encephalosis in Israel in 2008 was the first time this disease was reported outside of the African continent.

Undoubtedly, there will be additional new and re-emergent equine diseases in the years to come, some of which may have significant economic consequences for the equine industry in certain countries. Early recognition of such diseases is of paramount importance if their impact is to be minimized.

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Equine Urinary Disease

Primary renal disease remains uncommon in equids; however, development of acute kidney injury (AKI) with other disease processes is a serious complication that can increase morbidity and mortality. Of the approximately 2,000 horses presented to Michigan State University's Veterinary Medical Center each year, approximately 4% have increased amounts of waste products in their blood due to kidney insufficiency (azotemia with a serum creatinine concentration [Cr] >2.5 mg/dL [220 µmol/L]), and 1% have more severe azotemia with Cr levels exceeding 5.0 mg/dL (440 µmol/L).

Researchers have found that horses that presented with colic or colitis and had persistent azotemia (failure of azotemia to resolve after three days of treatment) were three times more likely to die or be euthanized as compared to patients in which azotemia resolved. Thus, prompt recognition of compromised renal function, minimizing the use of kidney damaging (nephrotoxic) medications, and institution of appropriate supportive care are critical to improve patient outcome.

Non-steroidal anti-inflammatory drugs (NSAIDs) that have a greater inhibitory action against cyclooxygenase-2 (COX-2) have been developed in attempt to limit the unintended side effects of NSAIDs. A misconception has developed that these medications exert less adverse effects on renal function than non-selective COX inhibitors (phenylbutazone and flunixin meglumine). However, COX-2 plays an essential role in maintenance of renal blood flow, thus use of COX-2 selective NSAIDs should not be considered renoprotective therapy.

Chronic kidney disease (CKD) may develop as a consequence of incomplete resolution of AKI leading to tissue degeneration and fibrosis (>90% cases) or immune-mediated renal disease (<10% cases), with rare cases associated with anomalies of development (renal aplasia, hypoplasia, dysplasia,

or polycystic kidney disease). Presenting complaints for CKD are vague and include decreased performance or loss of condition. However, a diagnosis of CKD is easily supported by characteristic laboratory abnormalities including azotemia, hypercalcemia, unconcentrated urine (isosthenuria), abnormal ultrasonographic findings, and the presence of kidney stones (nephroliths). Unlike people, removal of nephroliths is rarely helpful for horses with CKD unless they obstruct urine outflow.

CKD, by nature, is a progressive disease but the rate of progression varies widely between patients. Supportive treatment is focused on maintaining body condition through nutrition (pasture is the ideal diet) and avoiding use of nephrotoxic medications. In patients with immune-mediated renal disease and proteinuria, treatment with corticosteroids and angiotensin converting enzyme inhibitors may also be helpful. Supplementation with omega-3 fatty acids also merits consideration as this approach slows progression of CKD in dogs and cats (pasture is an ideal source of omega-3 fatty acids). Although long-term prognosis for CKD is poor, horses can do well for months to several years.

Finally, lower urinary tract disorders, including bladder stones (cystolithiasis), urinary incontinence, and blood in the urine (hematuria), are actually more common than upper tract disease. Considering that horses normally excrete large amounts of calcium carbonate and oxalate crystals in urine, it is somewhat surprising that urinary stones (urolithiasis) are less common in horses than dogs. Nevertheless, cystolithiasis in equids appears to have a recurrence rate approaching 50%, suggesting a genetic predisposition in affected horses. Horses with bladder muscle dysfunction due to foaling or trauma, neurological disease, or unknown cause, develop progressive bladder enlargement and overflow incontinence. Affected patients may also accumulate a large concretion of urine crystals into a mass that can be confused with a cystolith. However, this problem (sabulous urolithiasis), can be treated by dissolution through bladder lavage and affected horses should not be subjected to an unnecessary cystotomy surgery.

Lastly, an emerging syndrome of life-threatening idiopathic renal hematuria has been recognized in Arabian and part-Arabian horses. The author is trying to determine whether there may be a hereditary basis for this disorder, and would appreciate being contacted by anyone aware of suspected cases.

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KENTUCKY

Kentucky Equine Market Continues to Show Improvement

Horses have been one of the signature sectors of Kentucky's agricultural economy for many years. Equine receipts were the top agricultural commodity in the Bluegrass State for several years following the tobacco buyout and are typically one of the major economic contributors. However, like most sectors of the economy, equine markets were heavily impacted by the recession. Keeneland sales, a major driver of Kentucky equine receipts, fell by 53% from 2007 to 2010. Since that time period, equine markets have been largely in a state of recovery. Keeneland sales for 2014 were up by 40% from those reduced 2010 levels. Figure 1 shows the decrease in sales levels from 2007 to 2010 and the rally through 2014.

In addition to sales, stud fees are also a significant revenue stream for the equine sector. Figure 2 below shows an estimate of stud fee revenues in Kentucky based on the Kentucky Thoroughbred Breeder's Incentive Fund payouts. These estimates are likely conservative, since not all breeding activity is subject to sales taxes, such as using shipped semen, the stallion and mare both having the same owner, and the use of season shares and foal shares. However, the trend in revenues is likely a reasonable representation of the trend in breeding activity during this time period. According to Figure 2, stud fee revenues followed a similar pattern of weakness from 2007 to 2010, but have shown some improvement since then.

Recall that stud fee revenues are based on two factors: the stud fee and the number of mares bred. The only definitive way to increase stud fee revenues is an improvement in both of those factors. While stud fees may have been trending upward in the past few years, according to 2015 Kentucky Fact Book produced by The Jockey Club

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Stud, the number of mares bred to Kentucky stallions reached a near-peak in 2008 and fell steadily afterwards, only showing its first upward trend in 2013.

The fact that the improved sales levels of 2013 were sustained for 2014 was certainly a good sign for the equine markets last year and likely signals a significant recovery from the 2008 to 2010 time period. Improved sales also bode well for stud fees in the coming years, which have not seen the level of improvement that sales have. Widespread improvement in the equine markets would be welcome news in Kentucky, where equine typically accounts for a significant portion of the state's agricultural cash receipts and has significant secondary and tertiary effects on the state's economy.

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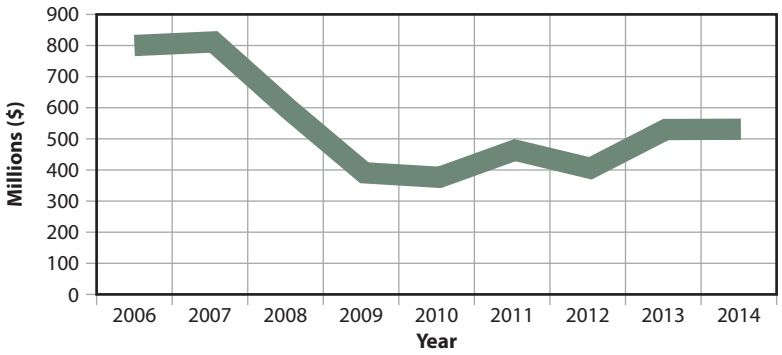
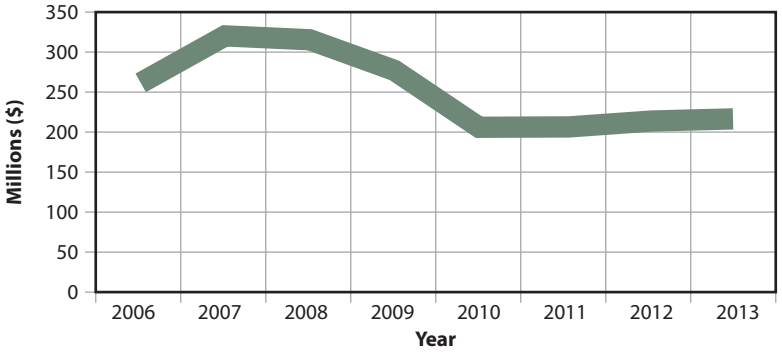
Figure 1. Annual Keeneland sales totals (2006-2014).



Source: Keeneland, www.keeneland.com/sales

Figure 2. Estimated revenue from stud fees in Kentucky (2006-2013).



Source: Kentucky Horse Racing Commission