EQUINE DISEASE QUARTERLY

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COMMENTARY

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LLOYD'S

FROM SEPTEMBER 25 THROUGH OCTOBER 10, 2010, the Kentucky Horse Park in Lexington, Kentucky, will host the Alltech FEI World Equestrian Games (WEG). More than 700 equine athletes representing 60 different countries are expected to be imported into Kentucky to compete in one of the eight World Championship competitions.

The Kentucky State Veterinarian's Office has regulatory responsibility to contain, manage, and resolve outbreaks of communicable equine diseases occurring at public venues, including large international competitions. Our office has spent the past three years working with the USDA Veterinary Services (USDA), the Fédération Equestre Internationale (FEI) Veterinary Committee, and the WEG Veterinary Services Coordinator to develop specific procedures for importation, disease mitigation, and infectious disease control. These procedures will be in addition to standard disease surveillance procedures practiced throughout the year at the Kentucky Horse Park. The WEG procedures and protocols include heightened biosecurity practices, strategically prescribed immunizations and acaricide (pesticide for ticks and mites) treatments, daily physical examinations of horses, and a centralized reporting system for abnormal findings.

A key component of the veterinary preparedness plan includes development of a temporary quarantine facility at the Cincinnati/Northern Kentucky International Airport. Seven separate barns totaling 220 stalls will be used for accommodation of arriving horses. A six-stall barn will be located within the quarantine area to allow further isolation of horses thought to present risk of disease introduction. In addition to routine importation testing for dourine, glanders, piroplasmosis, and equine infectious anemia, each horse will be monitored while in quarantine for a minimum of 42 hours prior to being released for transportation to the Kentucky Horse Park.

Initial blood testing and health monitoring of horses from countries that require a seven-day quarantine will take place at the USDA Animal Import Center in Miami, Florida, prior to transportation by air to Lexington. While teams representing countries affected with African Horse Sickness will be competing in the games, no horses will originate from these countries. These teams historically train and maintain their stables in Europe.

Each horse will undergo an extensive evaluation by state animal health officials prior to entering the stable area at the Kentucky Horse Park. With the exception of horses required to be stabled in the designated equine piroplasmosis isolation area, horses will be stabled together by discipline.

Piroplasmosis-positive horses must be housed in the designated isolation facility, which will be stringently cleaned, disinfected, and treated with effective acaricides to eliminate ticks, as required by the USDA. These horses will be treated for external parasites and an examination for ticks will be conducted each time the horse enters or departs from the isolation facility.

The veterinary preparedness plans include ensuring resources are available to assist in resolving a potential disease threat and includes an on-site veterinary center for treatment and needed isolation. Off-site veterinary hospitals with identified USDA-approved isolation facilities will also be available. In the event a communicable disease is suspected or confirmed, established protocols have been adopted and are in place to effectively manage the disease.

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INTERNATIONAL
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THE INTERNATIONAL COLLATING CENTRE, Newmarket, England, and other sources reported the following disease outbreaks.

Contagious equine metritis (CEM) was recorded in France, Switzerland, the United Arab Emirates (UAE), the United Kingdom, and the USA. France confirmed three cases on one premises and one case on another premises. Switzerland reported *Taylorella asinigenitalis* from a Poitou-donkey jack. An isolated case of infection with *T. equigenitalis* was confirmed in a mare in the UK; this had no connection with a previously reported stallion. A non-breeding Thoroughbred stallion tested positive for *T. equigenitalis* on pre-export testing in the UAE. As of September 3, the USA confirmed 22 stallions and five mares positive for *T. equigenitalis*. The carrier stallions were located in the following states: Georgia (1), Illinois (3), Indiana (3), Iowa (1, a gelding), Kentucky (4), Texas (1), Wisconsin (9). The carrier mares were in California (2), Illinois (2), and Wisconsin (1).

Chile reported an outbreak of equine herpesvirus-1 (EHV-1) abortion on one premises during August/September involving seven mares. Herpesvirus abortion occurred in South Africa involving 30 brood mares on five premises. Neurologic disease attributable to EHV-1 was diagnosed in seven horses in France. The USA reported an outbreak of EHV-1 myeloencephalopathy in Pennsylvania; six horses on one premises were euthanised. Isolated cases of respiratory disease, mainly caused by EHV-4, were diagnosed in France, Japan, and the UK.

Outbreaks of equine influenza were reported from France, the UK, and the USA. In France, multiple cases were diagnosed on two premises and an isolated case on a third premises. Influenza was confirmed on two premises in the UK. H3N8 equine influenza virus isolates were reported from five states in the USA.

Strangles was reported from Australia, Ireland, South Africa, and the USA. Four outbreaks occurred in Queensland, Australia. Ireland reported 13 outbreaks involving 18 cases on premises in three provinces. An estimated 40 horses on at least five premises were diagnosed in South Africa. The USA reported outbreaks similar in number to those of previous years.

Ireland, Switzerland, and the USA reported outbreaks of piroplasmosis. Ireland recorded three clinical cases. Three cases on separate premises in Switzerland were confirmed with *B. caballi* and/or *T. equi* infection. Seven horses were diagnosed with *T. equi* on a premises in Missouri, USA.

The USA reported a significant increase in the number of cases of Eastern equine encephalomyelitis (249) compared to 2008 (185). The greatest number of cases were in Florida, Georgia, and Mississippi.

Outbreaks of West Nile encephalitis were reported from Italy and the USA. In Italy, infection was confirmed in 45 horses, of which 28 were clinically affected and seven died. Two additional cases were diagnosed in separate areas of Tuscany. The USA reported 164 cases, of which the majority (64) occurred in Washington State.

Reports from the World Organisation for Animal Health (O.I.E.) in August/September confirmed the occurrence of sporadic equine cases of Venezuelan equine encephalomyelitis in three districts in Belize and on two premises in Costa Rica, Central America.

Sweden reported limited outbreaks of salmonellosis on three premises. An isolated case was diagnosed in Switzerland. Switzerland also confirmed single cases of anaplasmosis (*Anaplasma phagocytophila*) and borreliosis (*Borrelia burgdorferi*) on separate premises.

Equine Disease Quarterly

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NATIONAL

Neonatal Isoerythrolysis

NEONATAL ISOERYTHROLYSIS (NI) IS caused by an incompatibility of blood types between a mare and her foal. If a foal inherits from its sire a red cell factor (antigen) that the mare lacks, the mare may develop antibodies to that antigen. There is no harm to the foal *in utero*, as there is no comingling of the mare's blood with that of the fetus. However, these antibodies will be present in the mare's colostrum and will be ingested by the newborn foal. Following transfer across the foal's intestinal mucosa and entry into its bloodstream, the antibodies will attach to the foal's red blood cells and cause their destruction, resulting in a jaundiced foal and in severe cases, death, unless quickly diagnosed and treated. How mares become sensitized to red cell antigens they don't possess is a mystery, but transplacental hemorrhage or exposure to the foal's red cells during parturition have been suggested as possible mechanisms. A mare's first foal is seldom affected, but subsequent foals carrying the offending antigen will be at risk.

Horses have complicated blood types, consisting of 30 or more factors (antigens) that are grouped into systems (A, C, D, K, P, Q, and U). Factors within each system are designated with small letters. The factors most commonly associated with NI are Aa and Qa. Mares that are negative for these factors are the ones most at risk for developing anti-red cell antibodies. Approximately 19% of Thoroughbred mares are negative for the Aa or Qa antigens, and 17% of Standardbred mares are negative for Aa (Qa being extremely rare in Standardbreds). The relative frequency of these antigens in a breed determines the risk of a mating producing an NI foal. For example, only 3% of Thoroughbred mares might be negative for Aa, but since most Thoroughbred stallions are positive for Aa, the risk is greater that an incompatibility will occur.

Managing mares that are at risk for producing an NI foal consists of screening these mares for anti-red cell antibodies within the last 30 days of pregnancy or after udder development has begun. Sera from mares are tested against a panel of known blood types to determine the specificity and concentration of any antibodies that are present. While it has been standard practice to withhold foals only from mares with a titer of 1:16 or greater, some practitioners believe that any positive result, regardless of strength or specificity, is sufficient cause to withhold the foal from nursing. This is because in some cases, a low pre-partum titer to a red cell antigen may increase significantly just prior to foaling.

If an anti-red cell antibody is found in the mare, the foal should not be allowed to nurse the dam and should be given banked colostrum; the dam's colostrum should be stripped out over a 24-hour period before allowing the foal to nurse.

In a mare with a history of producing an NI foal, either all subsequent foals should be withheld from nursing the mare for 24 hours, as explained above, or the mare should be bred only to stallions that do not possess the red cell antigen to which she is sensitized.

Since DNA typing has widely replaced blood typing for identification and parentage purposes in the last 15 years, the number of laboratories offering blood typing and antibody screening services has diminished. Some large veterinary clinics offer NI testing and red cell typing for the most common antigens involved in incompatibilities. The University of Kentucky Animal Genetic Testing and Research Laboratory is the last major facility offering full blood typing and screening services (http://www.ca.uky.edu/gluck/ServEPVL.asp).

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Monitoring and Surveillance of Equine Infectious Diseases

DISEASE MONITORING IS THE ONGOING systematic collection, analysis, and distribution of health-related information. Surveillance is a process that is specific for a particular disease within a defined monitoring system and implies that an intervention strategy will be initiated at some predetermined threshold level. For a disease like equine infectious anemia (EIA) or cases of a foreign animal or transboundary disease, an intervention is initiated with the detection of a single case. For other diseases, mitigation activities begin only if multiple cases are observed or the disease event occurs in an environment where spread to other equids is likely.

The main purpose of veterinary monitoring and surveillance is to provide a basis on which rational decisions can be made concerning the control and prevention of infectious and/or communicable diseases that affect animal populations. For equids, the goals are to minimize the impact of disease on the health and welfare of the equine population and to prevent disruption in commerce or trade. Disease surveillance also benefits public health: equine infections with West Nile virus or Eastern equine encephalomyelitis virus indicate that people are also at risk within a locale.

Monitoring and surveillance systems are tailored to a specific set of objectives that generally include estimation of disease frequency (temporal and geographic distribution); certification that animals, farms, states, or countries are free of a disease; and detection of foreign animal or emerging diseases. Any surveillance system should be evaluated periodically and assessed through a formal review process. The Centers for Disease Control and Prevention has published guidelines[1] for evaluating surveillance systems that are applicable to human and veterinary diseases.

Equine disease surveillance data are collected most commonly from diseased animal cases. Diagnostic testing required by breed associations, a compulsory industry-initiated testing program, or interstate or international travel requirements also provides valuable data. While reports from veterinary diagnostic laboratories, academic institutions, or equine clinics constitute the majority of veterinary surveillance data, reporting by veterinary practitioners to animal health regulatory officials of infectious diseases is an invaluable component of a comprehensive surveillance system.

Surveillance denotes a process whereby animals are evaluated for evidence of past or present exposure to a particular infectious agent based on a formal sampling protocol; it is most useful in estimating disease prevalence. Currently, the United States Department of Agriculture, Animal Plant Health Inspection Service, Veterinary Services (USDA-APHIS-VS) is conducting, at the request of the United States Animal Health Association (USAHA) Infectious Diseases of Horses Committee, a targeted sampling of domestic horses in an effort to establish a national prevalence estimate for equine piroplasmosis caused by *Babesia caballi* and *Theileria equi*.

The decision to monitor a specific equine disease is made at the state level. While some diseases can result in excessive losses in equine populations, if they are ubiquitous in distribution, such as *Rhodococcus equi* infections or leptospirosis, they are not readily amenable to interventions.

The USDA's National Surveillance Unit recently established a Web site (http://www.aphis.usda.gov/vs/nahss/equine/index.htm) where the public can obtain up-to-date surveillance information, including maps that show the number and distribution of cases of EIA, vesicular stomatitis, and West Nile virus encephalitis. While the scope and quantity of available data is not extensive, it provides for a uniform method of reporting and has the potential to provide a central repository for national equine surveillance data.

[1]CDC. Recommendations from the Guidelines working group. Updated guidelines for evaluating public health surveillance systems. MMWR 2001;50 (No. RR -13).

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KENTUCKY

The Value of Horses to Kentucky's Economy

KENTUCKY CALLS ITSELF THE "HORSE CAPITAL of the World." Not surprisingly, the horse industry represents an important segment of the state's economy. In 2008, horses and mules were the No. 1 agricultural commodity in the state. Kentucky's top five agricultural commodities for 2008 ranked by value of receipts are shown in Table 1. (http://www.ers.usda.gov/StateFacts/KY.htm).

Receipts for horses/mules comprise nearly a quarter of Kentucky's agricultural commodity receipts. The more remarkable feature is that receipts for horses/mules in Kentucky comprise an estimated 92.7% of the total receipts for horses/mules in the United States. To explain this figure, it is helpful to understand that two factors are included in the value of receipts for horses/mules: sales of horses and sales of stallion services (stud fees).

Consider receipts from sales. Based on raw numbers alone, Kentucky's sales receipts would be difficult to eclipse given the combination of the quantity and quality of horses that are sold at the two major auction houses, Keeneland and Fasig-Tipton in Lexington. In 2008, Keeneland sold 8,194 horses for more than $73,000 each (http://ww2.keeneland.com/sales/lists/copy/recap.aspx); Fasig-Tipton's Lexington division sold 1,362 horses at an average price of over $31,000 (http://www.fasigtipton.com/results/2008/index.asp). The majority of these receipts are included in Kentucky receipts.[1] Finally, receipts from all other auctions and private sales are included as well, but receipts from the Thoroughbred auctions dominate. The second component of value of receipts is stud fees.[2] Kentucky leads this category in quantity and quality as well, which is again attributable to the Thoroughbred industry. In 2008, Kentucky accounted for 12% of Thoroughbred stallions nationwide but 40.7% of mares bred (the next highest state, Florida, has 7.6% of the country's stallions and 10.1% of mares bred).[3, 4] Moreover, stallions in Kentucky on average command significantly higher stud fees. According to the Blood-Horse MarketWatch 2008 (December 14, 2007), 100% of U.S. Thoroughbred stallions standing for a stud fee of at least $50,000 (n= 23) were in Kentucky. For stud fees between $15,000 and $49,999, 91% (43/47) were Kentucky stallions.

By dissecting the components of the value of receipts, it is of little surprise that horses/mules consistently remain one of Kentucky's top agricultural commodities and represent a major portion of total U.S. horse/mule receipts.

[1] Thoroughbreds brought to the Kentucky auctions from out of state are included in the value of receipts provided they reside in Kentucky for a sufficient amount of time prior to sale, such as when a seller hires a consignor for sales prep.

[2] A stud fee is the price of one breeding season to a stallion.

[3] Among stallions standing for a fee of at least $2,500.

[4] The Jockey Club, report of *2008 Thoroughbred Mares Bred*.

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Equine Proliferative Enteropathy

EQUINE PROLIFERATIVE ENTEROPATHY (EPE) is an emerging intestinal disease primarily of recently weaned foals. *Lawsonia intracellularis*, the causative bacterium of EPE, is capable of inducing similar disease in many animal species, most notably swine. To date, comparatively little research has been undertaken into the disease in horses.

The emergence of EPE over the last 15 years has been puzzling. Transmission between horses occurs by the fecal-oral route through environmental contamination of feed and water. Links have been proposed between the transmission of *L. intracellularis* from other domestic animals and wildlife to horses. Weaning, transportation, overcrowding, decreased colostral antibodies, dietary changes, and concurrent disease have been identified as predisposing factors associated with infection. Development of disease is usually sporadic; however, infection can become endemic on farms, and outbreaks have been described. The prevalence of *L. intracellularis* infection in the equine population is thought to be high, based

on serologic and fecal polymerase chain reaction (PCR) data, but the incidence of disease is considered low.

EPE can be difficult to diagnose clinically due to vague signs and lack of definitive diagnostic assays. Affected horses may develop one or more of the following signs: ventral edema, depression, fever, weight loss, colic, and diarrhea. Hypoproteinemia (low blood protein levels) remains the only consistent clinicopathologic finding. A presumptive diagnosis of EPE should be based on the combination of clinical signs, the presence of hypoproteinemia, ultrasonographic evidence of a thickened small intestine, detection of *Lawsonia*-specific serum antibodies, and the detection of the organism in the feces by PCR. Neither serology nor PCR alone should be solely relied upon for diagnosis, because these tests cannot identify and differentiate subclinical infection from EPE. A definitive diagnosis of EPE can only be made by examination of biopsy or necropsy samples for characteristic lesions and identification of the organism within the lesion by silver stains, immunohistochemistry, or PCR. Infections can be efficiently resolved with antimicrobial agents.

Once *L. intracellularis* is ingested by a susceptible animal, the bacterium makes its way to the small intestine, where it enters the undifferentiated small intestinal crypt epithelium. Here the organism replicates unchecked and alters the cell cycle of the infected cells. Infected cells remain immature and rapidly proliferate, which eventually results in a thickened and inefficient small intestinal mucosa that allows for increased protein and fluid loss with resultant clinical signs.

Retrospective studies have been performed to evaluate the long-term outcome for horses previously infected with *L. intracellularis*. Results indicate that previously infected yearlings sell for significantly less money but do not suffer from long-term health effects. Interestingly, lifetime earnings are not significantly different in comparison to uninfected horses.

At the University of Kentucky, 38 *L. intracellularis*-infected horses were identified at necropsy from 2004 to 2008 (Table 2). Infection was identified in the Thoroughbred, Standardbred, Quarter horse, American Miniature, and Mountain Pleasure breeds. Ages of infected horses ranged from 5 months to 18 years, but the majority of cases were identified in horses less than 1 year old. Necropsy findings commonly included a thin body condition, edema, and proliferative microscopic lesions in the small intestine. Not all of the identified horses developed clinical signs or EPE lesions, which suggests that some horses were subclinically infected.

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Table 1.

Top agricultural commodities in Kentucky (2008)

	VALUE OF RECEIPTS *(thousand $)*	PERCENT OF STATE TOTAL FARM RECEIPTS	PERCENT OF U.S. VALUE
1. Horses/Mules	1,080,000	22.3	92.7
2. Broilers	743,805	15.4	3.2
3. Corn	653,037	13.5	1.3
4. Cattle & Calves	574,379	11.9	1.2
5. Soybeans	383,971	7.9	1.3
ALL COMMODITIES	4,837,756		1.5

Table 2.

Number of *L. intracellularis* - infected horses identified at necropsy (2004 - 2008)