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COMMENTARY

IN THIS ISSUE

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LLOYD'S

JUST WHEN WE THINK LIFE IS UNDER CONtrol, Mother Nature surprises us with something new or unusual.

Emerging issues such as methicillin-resistant *Staphylococcus aureus* infections in horses, ivermectin-resistant parasites, and the ever-present threat of foreign animal disease pathogens entering the United States via insects or migrating birds pose never-ending challenges to researchers, in both veterinary and human medicine.

After first being recognized in the 1960s, equine neurologic herpesvirus disease was diagnosed sporadically. It did not occur as recognized outbreaks of disease, as has been experienced recently. A mere one-point mutation in the DNA of the virus changes it from a "typical" herpesvirus respiratory or abortion clinical presentation to one that neurologically affects healthy adult horses. While it is an amazing feat of scientific discovery to have determined this mutation, researchers have significant work ahead in seeking effective prevention and treatment for this devastating disease.

Natural surprises can also appear in the forms of deeply buried faults in the earth's geography, such as the New Madrid Fault. It is likely not known by a majority of veterinarians and equine owners that this fault is in the middle of the American heartland along the central Mississippi River Valley from northeastern Arkansas to southern Illinois. Because of the difference in geography between California and the Mississippi River Valley, an earthquake at the New Madrid Fault of 6.0+ on the Richter Scale would be much more devastating than in California.

Why are earthquakes discussed in this issue of the *Equine Disease Quarterly?* Imagine that all bridges crossing the Mississippi River from St. Louis to Memphis were so structurally damaged that they were closed for weeks to months, even years. The impact on commerce, travel, and infrastructure would be enormous, including that to horse farms and all ancillary businesses. A major New Madrid Fault earthquake could impact a significant portion of the United States, making the hurricanes of 2005 seem like a warm-up exercise in disaster management. Preparation for unexpected events as well as predicted blizzards, tornadoes, flooding, etc., is critical to the horse economy.

While this discussion may sound like the plot of a made-for-TV movie, the reality is that the New Madrid Fault is real, and earthquakes cannot be predicted like some other major natural disasters. Preparing for common natural disasters can go a long way toward preparing for a rare, but significant, disaster, whether it be an earthquake, an overturned tanker or railway car carrying hazardous materials, or a barn fire.

Likewise, having a biosecurity plan in place for that unexpected disease outbreak of fetal losses, respiratory or diarrheic disease or, in the worst case, diseases of undetermined etiology and transmission, can make response time much faster and less costly than having to plan and implement at the same time.

Preparing for the worst with an emergency family and animal plan can make the anticipated, predictable disasters more manageable. Mother Nature almost always has the last word.

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INTERNATIONAL
Fourth Quarter 2006

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

African Horse Sickness was reported on three premises in two provinces of South Africa. In the Southern Cape, Serotype 9 was isolated. It was the same serotype isolated from cases in the area in July 2006, suggesting that the virus had persisted over the winter period. Cases were also reported in northern parts of KwaZulu-Natal Province in December.

In October, *Taylorella equigenitalis*, the causative agent of Contagious Equine Metritis (CEM), was isolated from two Lipizzaner stallions imported from Slovakia, Eastern Europe, to the state of Wisconsin, USA. The organism was isolated from genital swabs obtained during a routine breeding soundness examination after the animals had been tested and released from federal quarantine. The stallions had been resident on the same premises since their importation and had not been used for natural breeding, although semen had been collected but not used. The stallions have subsequently undergone courses of treatment prior to being retested for the presence of the bacteria.

Respiratory disease attributable to equine herpesvirus (EHV) was diagnosed among foals on several farms in Argentina, among a variety of breeds of horses in France, and among horses that had been recently imported into the United Arab Emirates. Abortions attributable to EHV-1 were reported on six premises in two provinces of South Africa. Several outbreaks attributable to the neurological strain of EHV-1 were confirmed in various parts of the United States during the fourth quarter and into January 2007. These outbreaks included cases at Monmouth Racetrack, New Jersey, and among patients at the veterinary hospital of Colorado State University in October. In December, cases were also confirmed on several premises in Florida. They included horses preparing for an equestrian event in Wellington. They had had contact with a horse released from the New York quarantine facility that had been imported from Germany at the end of November. Thirteen cases and six deaths were reported, and 10 premises in Florida, including Payson Park Training Center, were placed under a state quarantine. By January 20, restrictions on all premises had been lifted. In California, a case was diagnosed at Golden Gate Racetrack in December and another in January 2007 at Los Alamitos Racetrack.

Equine Infectious Anemia (EIA) was confirmed among 22 horses on seven premises in Germany. In Ireland, 28 cases of EIA have been identified since the initial diagnosis of the outbreak in June as the result of the administration of an infected equine biological product. In Italy, 83 horses have been positively identified for EIA, which includes indigenous and imported animals.

Equine influenza was confirmed among a variety of breeds of horses in France and among circus horses in the United Kingdom.

Rotavirus infection was diagnosed among foals ranging in age from 2 to 4 months on eight premises in Argentina. Numerous outbreaks of strangles were recorded in Ireland, South Africa, and Switzerland.

For the year 2006, the USDA reported 1,032 equine cases of West Nile Virus (WNV) throughout the United States, a third of which were in the state of Idaho. Over the same period the Centers for Disease Control and Prevention reported 4,180 human cases, including 149 fatalities.

Equine Disease Quarterly

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International Collating Centre

AN EQUINE VIRAL ARTERITIS (EVA) OUTbreak in Central Kentucky in 1984 provoked extensive international reaction, including restrictions controlling the movement of horses. As a consequence, it was decided to establish an international reporting system for equine infectious disease that would be industry sponsored. The Office International des Epizooties (OIE) based in Paris was and continues to this day to be responsible for reporting "notifiable" diseases such as African Horse Sickness, Vesicular Stomatitis, and Venezuelan Equine Encephalitis based on information received from federal authorities. There was, however, no reporting system for diseases including equine influenza, EVA, strangles, and equine herpesvirus infections—diseases that have major welfare and economic impacts.

Responsibility for developing the reporting system was undertaken by the International Breeders Meeting (IBM), a consortium of national Thoroughbred breeder organizations that meets approximately every 18 months. The IBM requested its 20 member countries to submit disease reports every three months to a collating center at the Animal Health Trust, Newmarket, England. Each country pays a fee to cover administrative costs and in return receives a quarterly report summarizing the information.

The United States is represented by the Thoroughbred Owners and Breeders Association (TOBA). Dr. David Powell of the Maxwell H. Gluck Equine Research Center has submitted information on behalf of TOBA since the program's inception in the mid-1980s. Reports are provided to the International Federation of Horseracing Authorities and its International Movement of Horses Committee, federal veterinarians, and national equine industry organizations.

While not without its imperfections, the network has developed a group of knowledgeable veterinarians representing each country who communicate frequently, providing accurate and up-to-date information of disease incidence. By doing so, they play an important part in facilitating the international movement of horses.

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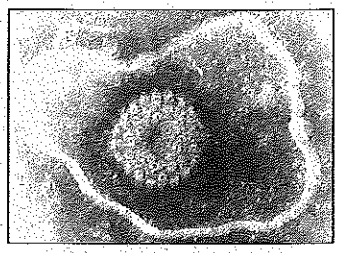
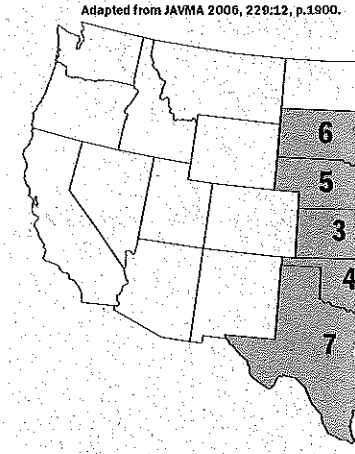


Figure 2.
Cases of Rabies in Hor

Adapted from JAVMA 2006, 229:12, p.1900.



NATIONAL

Demystifying Neurologic Herpes

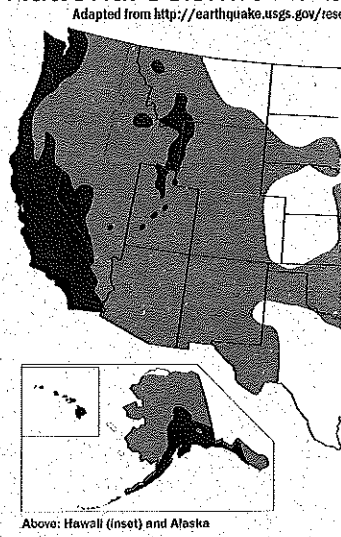
OUR ATTENTION HAS RECENTLY BEEN captured by reports of numerous outbreaks of equine herpesvirus-1 (EHV-1) (See Figure 1) neurologic disease at racetracks, show venues, clinics, and boarding stables across the country. Questions about the neuropathogenic herpesvirus are the buzz of the industry. The intent here is to address several misconceptions about neurologic herpes in response to questions most frequently put to investigators at the Maxwell H. Gluck Equine Research Center.

The neuropathogenic strain of EHV-1 is not a "business-as-usual" equine herpesvirus. Although only a single, tiny mutation within its genome has been revealed by comparative DNA sequence analysis, that small genetic change has huge consequences for the virus's behavior in the horse. The fateful mutation has turned the microbe into one with enhanced replicative powers and as a consequence increased pathogenic potential. The mutant (neuropathogenic) strain of EHV-1 replicates to very high levels—tenfold higher than the wild type strain—in the upper respiratory tract, blood leukocytes, and vascular endothelium of the infected horse. Its pathogenic hallmark is a shift toward more severe morbidity and greater mortality. This is the result of ischemic damage to the horse's central nervous system ignited by a widespread and intense inflammation of virus-infected, blood vessel endothelium.

Because of its replication-facilitated increase in the level of nasal shedding, the mutant EHV-1 strain has also acquired the ability to

Figure 3.
National Seismic Haza

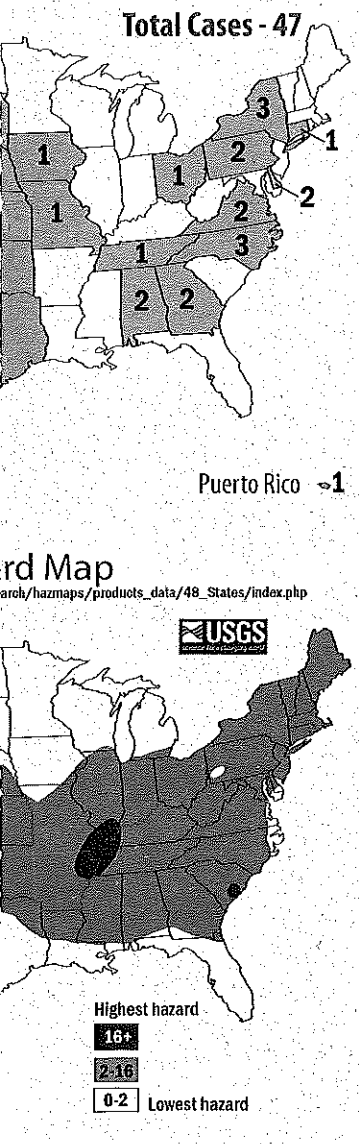
Adapted from http://earthquake.usgs.gov/res



Above: Hawaii (inset) and Alaska

Figure 1.

Electron Micrograph of Equine Herpesvirus-1



spread more efficiently, another essential feature of epidemic strains of viruses. Other than its exaggerated replicative capacity, however, no additional attributes distinguish the mutant strain of EHV-1 from its wild-type parent. The two genetic strains of EHV-1 exhibit no known differences in their antigenic composition, susceptibility to disinfectants, or tropism for nervous tissue of the horse.

The horse has no hiding place from neurologic EHV-1! Circulating within the world's horse population at least since the time of its first isolation in 1966, neuropathogenic strains comprise 15% of the current biological reservoir of latent EHV-1. The mutation event has occurred on multiple occasions and in each of the six evolutionary branches of the virus. Recent surveillance studies at the University of Kentucky Livestock Disease Diagnostic Center indicate that approximately 6% of today's horses are latently infected with a neuropathic genotype of EHV-1. With such compelling statistics, it is apparent that there is no justification for culling or quarantining latent carriers of the mutant herpesvirus or for any differential treatment of survivors of EHV-1 neurologic disease.

More worrisome is that vaccination, the cornerstone for prevention of infectious diseases, offers little assistance for controlling outbreaks of neurologic EHV-1. Limited scientific evidence exists that any currently marketed vaccine for EHV-1 will provide significant protection against the neurologic manifestation of infection. None of the licensed products carries a label claim for efficacy in preventing central nervous system disease from infection by EHV-1. Efforts at further vaccine development for the disease are conceptually behind, and much catching up is required. Without an efficacious vaccine, an epidemic of EHV-1 paralytic disease could be a scary and potentially devastating scenario.

Furthermore, the most effective strategy for curtailing the spread of the neurologic herpesvirus and blunting its epidemic mortality—keeping horses minimally stressed and physically segregated—does not fit well into the densely populated, heavily intermingling, high-stress environments of racetracks, show events, training centers, or boarding/riding stables. And, finally, efforts at pharmaceutical intervention via antiviral treatment of neurologic herpes have shown little immediate promise. The unsettling consequence of such a triad of management failures (ineffective segregation, vaccination, and antiviral therapy) is that there is currently no foolproof method for either prevention or treatment of neurologic EHV-1, and its threat for disruption of large equestrian events is therefore likely to continue.

The only remaining weapon in our arsenal against infectious diseases is containment and elimination of the viral infection at its point of origin by the practices of isolation, quarantine, and testing. This containment effort will be facilitated by a recent, novel test procedure for rapid identification of horses infected with the neuropathogenic strain of EHV-1. However, random application of the PCR diagnostic procedure to test for the presence of neuropathogenic EHV-1 DNA in the blood of asymptomatic horses not associated with an ongoing disease outbreak represents an inappropriate use of the procedure. The precise interpretation of positive test results in such instances would not be possible due to issues of latency, silent reactivation, residual dead virus, vaccination, etc.

Overall, the prevailing situation with neurologic EHV-1 highlights the importance for all facilities in which large numbers of horses of diverse origin congregate for purposes of shows, racing, training, sales, etc., to have established and well-rehearsed plans as well as the necessary physical facilities for

1. defining the requirements for entry of horses into the facility
2. temporary isolation of new arrivals during an observation period
3. rapid infectious disease control responses in the face of an EHV-1 neurologic outbreak.

Useful information on the establishment of such contingency plans can be found at the following Web sites:

www.aaep.org/pdfs/control_guidelines/Biosecurity_instructions%201.pdf

www.aphis.usda.gov/vs/ceah/ncahs/nahms/equine/equine05/equine05_infosheet_biosecurity.pdf

www.usef.org/documents/competitions/2007/EHV.pdf

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Rabies in the United States and Puerto Rico, 2005

THE DECEMBER 15, 2006 EDITION OF THE *Journal of the American Veterinary Medical Association* reported the annual summary of 2005 rabies surveillance in the United States and Puerto Rico (JAVMA 229:1897-1911). This summary provides a comprehensive evaluation of the status of this disease in multiple species throughout the country.

Figure 2 shows the locations of equine rabies cases in 2005. The 47 cases in horses and mules had increased from 43 in 2004 and included one case in Puerto Rico. Forty-nine states and Puerto Rico had cases of animal rabies. Only Hawaii had none. Rabies cases in domestic species (dogs, cats, cattle, horses/mules, sheep and goats) totaled 494. There were an additional 5,923 cases in wild animals.

All states except Hawaii, Arkansas, and Puerto Rico had cases of bat rabies, totaling 1,408, with Texas (257) and California (167) having the highest number of positives. One human case of rabies (bat variant) was reported from Mississippi.

These surveillance data indicate the need for continued vigilance in rabies recognition among domestic animals and vaccination of animals in high-risk areas.

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KENTUCKY

New Madrid Fault—Earthquakes in Kentucky

EARTHQUAKES ARE THE MOST DEVASTATING of natural hazards and not usually considered as a potential risk to property or lives in the southeastern United States. The West Coast of the United States is under constant threat of a large earthquake and experiences smaller seismic events on a daily basis (See Figure 3). Less recognized is the considerable seismic activity in the Kentucky area. A series of earthquakes with the most extensive impact ever recorded occurred 200 years ago just west of Kentucky along the New Madrid Fault zone. This area, comprising 220 miles of major faults, stretches from New Madrid, Missouri, far south of Blytheville, Arkansas, and consists of seven major connecting faults.

From December 1811 to March 1812, an estimated 3,600 shocks were generated in the New Madrid Fault zone, including three major quakes thought to have been of a magnitude of 8.1 or greater on the Richter scale. The area with most severe damage covered 5,000 square miles, and the effect on the landscape and settlers in the region was profound. Eyewitness accounts of these events describe the land as "undulating like the ocean," the disappearance of hundreds of miles of riverbank along the

EARTHQUAKE PREPARATIONS

While no one can accurately predict a major earthquake, here are simple procedures that any farm owner can take to mitigate damage on the farm, most of which also apply to standard preparedness for other disasters:

- Have a personal and family disaster preparedness plan in place. For help, go to http://www.fema.gov/plan/index.shtm
- Maintain building structures and foundations in proper repair.
- Bolt all shelving and cabinets solidly to wall studs, not plasterboard.
- Keep heavy objects on low shelves.
- Ensure that all cabinets have a locking mechanism to prevent opening during movement.
- Store chemicals (disinfectants, insecticides, etc.) on low shelves in a closed, sturdy cabinet. Carefully consider storage of any flammable liquids or chemicals to help prevent spillage. Never store ammonia and bleach together, as toxic gases are produced when these chemicals are mixed.
- Hang heavy objects (shelving, televisions, bookcases, etc.) away from areas where people sit.
- Use straps to secure water heaters to wall studs or supports.
- Secure all overhead lighting fixtures.
- Know where and how to turn off all utilities to buildings.
- Have all animals properly identified in case they get loose.
- Keep temporary fencing materials on hand for repair of downed fencing.
- Consider purchasing earthquake insurance.
- Remember that human safety always comes first.

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Mississippi, and the creation of 10 large lakes. Chasms opened in the ground, acres of land were thrust up in the air, and entire towns and villages were lost in each of the large quakes. Tremors were severe throughout Kentucky, with buildings impacted by shaking as far away as Montreal. Church bells rang in Pennsylvania and South Carolina as a result of the quakes. Significant damage to people, animals, and property was felt in an area the size of Texas, but the shaking was experienced over an area of 1 million square miles.

Earthquakes, like volcanoes, are usually associated with active plate boundaries where two large tectonic plates collide, such as the subduction zone around the Pacific Ocean. The infamous San Andreas Fault, which has produced several large earthquakes in the past 200 years, is part of a major boundary between the North American and Pacific plates, which move laterally relative to each other in California at a rate of about 1 inch per year.

It is less clear, however, how a huge earthquake could have been triggered within a stable plate, such as the New Madrid Fault, rather than at the volatile boundaries, such as at the San Andreas Fault. The question remains: can such a large quake occur again on the New Madrid Fault? If so, when?

The New Madrid Fault zone is somewhat of an enigma, which makes estimating the likelihood of future earthquakes very difficult. Palaeoseismic studies in this area have deduced that large earthquakes did occur previously, with four major events in the last 1,500 years. Typically, these large quakes occur in "triplets," or temporal clusters, as they did in 1812. On the other hand, there is no surface evidence of movement of the earth's crust along these faults, which would suggest limited buildup of stress to trigger another earthquake. Geologists have hypothesized that magma intrusions at depth facilitate these large earthquakes like a volcanic eruption that does not break the surface and that the vast extent of destruction is a result of the deep ocean and river sediments in the Mississippi embayment, which are readily deformed and transmit stress much farther than bedrock.

Presently, seismic activity is monitored in the New Madrid Fault zone, and earthquakes occur on a weekly basis. Most of these register below 2.0 on the Richter scale, but occasionally larger quakes are recorded, such as the 4.0 event near Paducah in 2003. When will the next "big one" hit in this area? No one knows.

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