Equine Disease Quarterly

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IN THIS ISSUE

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COMMENTARY

Recent epidemics of insect-borne viral diseases involving horses figure prominently in this issue of the *Quarterly*. The epidemic of Venezuelan equine encephalitis (VEE) in Venezuela and Colombia has caused extensive human suffering and equine fatalities on a scale not recorded since the last major VEE epidemic occurred some 24 years ago. Eastern equine encephalitis (EEE) accounts for the death of several hundred horses each year in the United States. The epidemic of vesicular stomatitis in the western states continued through October and November.

The study of insect-borne viral diseases, particularly those affecting the horse, has received scant attention in recent years. The primary reason is the long interval between epidemics with public and scientific interest waning during the intervening years, despite the associated public health risks. As a result the natural life cycle of these viral infections and the source of outbreaks is poorly understood.

In human and veterinary medicine there is concern with regard to the escalating emergence of insect-borne diseases. Contributing factors involve manipulation of the environment as well as natural environmental change. In areas of expanding urbanization abroad, sewage polluted water increased the number of mosquito breeding sites. In the United States, the preservation of wetlands and endangered species has limited measures to control insect populations. The importation of used tires permitted introduction of the Asian tiger mosquito which has proved to be an effective viral vector.

At the recent meeting of the United States Animal Health Association, a symposium discussing vesicular stomatitis concluded the outbreak constituted a "wake-up call" to producers, horse owners, regulators and scientists. In the context of animal disease, history indicates that wake-up calls are effective only if the recipient responds, rather than going back to sleep.

INTERNATIONAL

Third Quarter 1995

The International Collating Centre, Newmarket, confirmed the following disease outbreaks. Respiratory disease attributable to EHV-4 was reported from Australia, France, Ireland, South Africa, Sweden and the United Kingdom. Equine-2 influenza was reported from France, Sweden, Switzerland, the United Kingdom and the United States. Equine viral arteritis was reported from Switzerland and the United Kingdom following the test mating of seropositive Standardbred stallions. Cases of tetanus were reported from premises in Hokkaido, Japan. Vesicular stomatitis cases in the United States continue to be confirmed in Colorado, New Mexico, Utah and Wyoming. There were no further reported cases in Arizona and Texas and restrictions on the single premise involved in each state have been lifted.

Australia reported a second fatal human case possibly associated with equine morbillivirus infection, in a 35-year old farmer from Queensland who died on October 21. The farmer became ill some 12 months previously and was recently hospitalized with signs of encephalitis. Samples taken prior to death indicated a high antibody titre to the virus and antigen was detected in cerebrospinal fluid. Whether the cause of death was directly attributable to the virus is under investigation. The farmer had assisted his wife, a veterinarian, in the necropsies of two horses euthanized on their farm in August of last year. Examination of preserved tissues from one of the horses has now confirmed it was infected with equine morbillivirus. Preliminary investigations to date have not established any link between these cases and horses which died near Brisbane during September 1994.

VEE Outbreak in South America

Venezuelan equine encephalitis (VEE) is a viral disease which primarily affects horses and humans. This disease occurs sporadically in Central and South America, although the last major outbreak in 1969-1972 crossed the border from Mexico into Texas. The recent outbreak began May 1995 in Venezuela and spread westward to the northernmost state of La Guajira, Colombia in September **(Figure 1)**. According to recent reports, VEE has affected more than 15,000 people, causing 42 deaths. Approximately 500 horses have died from the disease in Venezuela; however the extent of the outbreak among the nearly 100,000 horses, mules and donkeys in the area of La Guajira is unknown.

In horses VEE causes neurologic signs of depression, incoordination, circling, blindness and sudden death. The disease is clinically indistinguishable from Western and Eastern equine encephalitis. VEE in humans causes severe headache, convulsions, muscle pain, vomiting and weakness and may advance to severe neurologic symptoms. Diagnosis is confirmed by virus isolation and serum neutralization tests. Viral strains from human patients during the current outbreak have been identified as the IC-subtype.

Because of the mosquito vector involved in the life cycle of the disease **(Figure 2)**, environmental conditions play an important role in the occurrence of epidemics. Northern Colombia recently had the heaviest and most prolonged rainfall in the past 20 years. This has led to an increase in mosquitoes of up to 70% in some locations. The horse is the viral amplifier in nature, with mosquitoes transmitting the disease to other horses and humans. Human to human aerosol transmission is possible since the virus has been isolated in the pharynx of infected patients.

Prevention of the disease includes destroying larvae and breeding places of mosquitoes; using insecticides and insect repellents to prevent bites on humans and horses; quarantining farms with affected horses; and limiting equine transportation through affected areas. Vaccination of horses in affected areas is essential. As of October, virtually all horses, mules and donkeys have been vaccinated in La Guajira and neighboring states utilizing the live attenuated vaccine TC-83.

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Figure 1.

Areas with Epidemic VEE

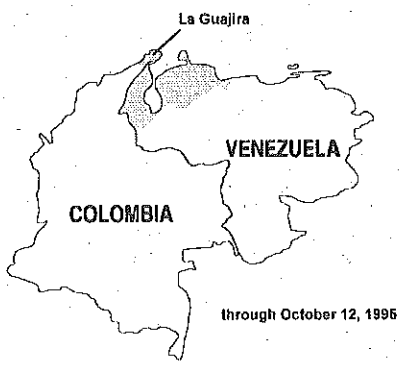
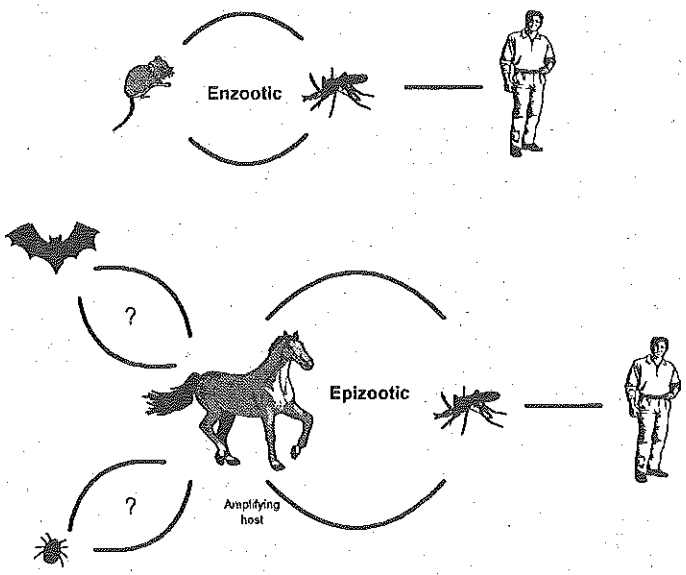


Figure 2.

VEE Transmission Cycles



Equine Disease Quarterly

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Equine Influenza

Respiratory disease caused by equine influenza virus has remained a worldwide problem of the horse industry. The third international consultation on equine influenza was held at the Animal Health Trust, Newmarket, UK on September 18-19, 1995. Organized by Dr. J. Mumford, it included experts from the Office International des Epizooties (OIE), World Health Organization (WHO), USDA and numerous laboratories and vaccine manufacturers.

The meeting was held primarily to examine recent trends in antigenic drift of circulating equine influenza virus strains and develop recommendations on vaccine content to assist manufacturers. A secondary purpose was to develop a coordinated system for ongoing review and communication among researchers, vaccine manufacturers, and vaccine regulatory authorities, of the findings of international surveillance efforts.

Failures of vaccination to protect horses from influenza were reported from different countries. Many of the existing equine influenza vaccines use influenza A/equine-2/Miami/63 or related virus strains from the 1960s as their principal equine-2 (H3N8) virus component. These strains have been superseded by new antigenic variants now in circulation. Information presented at the meeting showed that Miami/63 virus was no longer useful as a vaccine strain and should be removed from equine influenza vaccines.

Results of worldwide surveillance also revealed that since 1989, distinct families of equine-2 viruses have developed in Europe and the Americas. Nonetheless American-like viruses have been isolated in Europe and vice-versa as a result of the international movement of horses. Challenge studies in horses demonstrated that antigenic differences between these families could compromise vaccine effectiveness.

The meeting concluded that to replace Miami/63 virus as the equine-2 component of vaccines, manufacturers should select representatives of both the virus families now circulating, and specifically listed Kentucky/94 and Newmarket/2/93 viruses. Equine-1 virus such as Prague/56 should be retained in the updated vaccines since serological evidence suggests this virus may still be present in the equine population.

The meeting also recommended continued efforts should be made to isolate and characterize equine influenza virus isolates especially from areas outside of Kentucky and western Europe. Equine influenza experts agreed to meet annually to review information on the viruses in circulation and notify manufacturers when vaccine changes are needed. Vaccine manufacturers are encouraged to harmonize their selection of virus strains for future vaccines in order to facilitate production of quality-testing reagents. Ways should be sought to minimize delays in licensing updated vaccines by the regulatory authorities in Europe and the United States.

When these recommendations are accomplished, more timely updating of equine influenza vaccines will take place and this should reduce or eliminate the negative impact of viral antigenic drift on the field performance of equine influenza vaccines.

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N A T I O N A L

WEE and EEE Update

The following information represents a compilation of reports provided by the Centers for Disease Control (CDC), the National Veterinary Service Laboratory (NVSL), and the Kentucky Department of Agriculture.

In 1994, 5 equine case of Western equine encephalitis (WEE) were reported from 3 states—Idaho, Wyoming and Texas—compared to 13 equine cases reported from 10 states in 1993. So far this year, to October 31, no cases of WEE have been reported.

The 173 equine cases of Eastern equine encephalitis (EEE) reported during 1994 was approximately double the number reported in 1993. The majority, 93, were reported from Florida with South and North Carolina and Michigan each reporting between 10 and 20 cases. Cases were also reported from Georgia, Alabama, New Jersey, Indiana, Louisiana, Ohio and Virginia. By the end of October of this year, 83 equine cases of EEE had been reported including 37 from Florida. Four human cases have been reported during the same time period this year, one of which was fatal. Increasingly EEE is being diagnosed among emu and a variety of domestic animals including dogs and pigs as well as various wild and domestic birds.

A fatal equine case of EEE occurred in western Kentucky during September 1995 on a farm with 15 unvaccinated horses and a donkey at pasture. The farm bordered an area of wetlands and the insect

population was considered to be greater than normal because of recent high rainfall. The last reported case of EEE in the area was approximately 10 years ago.

An eight-year old mare with a foal at foot developed colic and became incoordinate. The mare had a tendency to turn left and her nose and upper lip were deviated to the left. There was no response to therapy and after eight hours, the mare became recumbent and was unable to rise. The following day the mare was euthanised and submitted to the Murray State University Veterinary Diagnostic Center for necropsy examination. EEE virus was subsequently isolated from brain tissue submitted to NVSL.

Two other horses on the farm had earlier exhibited signs consistent with encephalitis during September. One had died with no samples collected but a second had survived. A convalescent serum sample taken from this four-year old mare revealed antibodies to EEE but not WEE or VEE. Serum samples were obtained from the remaining horses and donkey on the farm. Two of 13 samples, from 3- and 12-year old mares, exhibited EEE titers but none to WEE and VEE, indicative of recent EEE exposure.

The real increase in the incidence of EEE should encourage horse owners and veterinarians to ensure that all horses, particularly in the eastern states, are routinely vaccinated against the disease.

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Maintaining Fluid Balance In Exercising Horses

More than big jumps and fierce dressage competition will confront the horses and riders at the Olympics in 1996. The combination of Georgia's high temperature and humidity in late July and early August is expected to challenge both equine and human athletes. While temperatures above 80°F can be expected to stress all horses, the three-day eventers will be at highest risk for heat related problems.

The second day of the three-day event comprises four phases of endurance. Phases A-C include roads and tracks and a 2-3 km steeplechase. Phase D, cross-country, is the most rigorous, and is likely to result in heat stress if the environmental temperature and humidity are high.

Three-day event horses have been reported to lose up to five gallons of water, mostly in sweat, during the endurance test. Greater losses could be expected when the temperature is high. Sweating horses also lose significant amounts of electrolytes. Ironically, some horses experiencing large sweat losses will have a depressed thirst response, which impairs their ability to replace their fluid losses during or after exercise. If sweat losses are large and are not replaced, horses may be affected by heat exhaustion. Problems that can result from exercise in the heat include: weakened pulse and prolonged capillary refill time, elevated rectal temperature, cardiac irregularities, elevated heart rate, muscle cramps and depression.

To assist horses in regaining or maintaining an appropriate hydration state, researchers at the University of Kentucky have been investigating the effect of dietary fiber on water balance during exercise. Although diets containing more dry feed increase a horse's water intake, it was unknown whether differences in diet would be of any use to the horse during exercise.

In a recent study, horses given 15.62 lb of feed in the evening meal drank 4.3 gal of water before their exercise the next morning, while horses that ate 9.9 lb of feed drank only 2.9 gal of water. The higher intake diet contained a large amount of hay, whereas the lower intake diet provided less hay and more grain, but about the same amount of calories. It was hypothesized that the higher fiber diet would hold water in the gastrointestinal tract and provide a water reservoir during exercise.

When the horses receiving the test diets were exercised, total sweat losses were similar in both treatments (about 5.28 gal/horse) but the horses receiving the hay diet had lower plasma total protein concentrations. The lower total protein concentrations were interpreted to mean that the high hay diet did allow the horses to maintain a better hydration status. This suggests diets utilizing large amounts of good quality hay will assist horses in maintaining fluid balance during exercise.

Diets that encourage water intake and help the horse maintain a fluid reservoir in the gut may also be useful when horses are subjected to shipping long distances.

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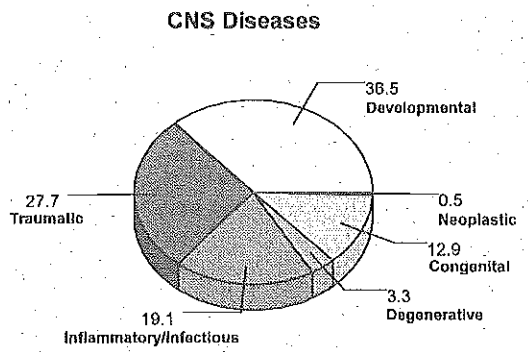
K E N T U C K Y

Central Nervous System Diseases

Of 4,559 horses necropsied at the Livestock Disease Diagnostic Center from January 1993 through October 1995, 397 or 8.7% had diagnoses which pertained to the central nervous system (CNS); **(Figure 3)**. The most common was the developmental condition cervical vertebral malformation/malarticulation (CVM), commonly known as wobbles or wobbler syndrome. One hundred forty-five cases of CVM were diagnosed, representing 3.2% of the total equine cases and 36.5% of the neurologic cases. Of the 145 cases, 124 (85.5%) were Thoroughbreds with the remainder being a roughly equal distribution of Standardbreds, Saddlebreds, Tennessee Walking Horses and others. *(Note:* 73.0% of all equine necropsy cases examined at the Livestock Disease Diagnostic Center were Thoroughbreds). Ages ranged from 3 months to 23 years with 71.0% being 1 year old or less. One hundred eighteen (81.4%) of the cases of CVM were males.

There were 110 cases categorized as traumatic injury to the CNS (27.7% of cases). They included 46 horses with vertebral fractures, 29 with fracture of the skull, 15 cases of vertebral subluxation and 10 cases each of meningeal and subdural hemorrhage. Vertebral and skull fractures were seen in all age groups. Fifty-six percent of the vertebral fractures occurred in the cervical spine, 35.3% in the thoracic spine and 8.7% in the lumbar spinal column. Cervical vertebral fractures tended to occur in younger horses (mean age 2.4 years), while fractures in the thoracic and lumbar areas were in older horses (mean age 5.7 years).

Figure 3.



The third most common category consisted of infectious/inflammatory conditions with a total of 76 cases (19.1% of cases). This category included combinations of encephalitis, myelitis and meningitis which, based on the type of reaction present, were considered to be the result of a bacterial, viral, or protozoal infection. The most common disease in this category and the third most common CNS diagnosis overall was equine protozoal myeloencephalitis (EPM) with 37 cases, representing 9.3% of the CNS cases. Seventy-three percent of these cases were in Thoroughbreds and 60% were females. Ages ranged from 4 months to 26 years old with an average age of 6.4 years. There were also three cases of rabies.

The next most common diagnosis was myelopathy with 31 cases. This diagnosis indicates disease of the spinal cord but is non-specific in that the cause of the damage could not be ascertained. These could represent additional cases of wobbler syndrome or they might be infectious such as EPM or traumatic in origin. Myelopathy cases were grouped with other diagnoses into the degenerative category which totaled 51 cases (12.9% of cases). Other diagnoses in this category included leukoencephalomalacia or moldy corn poisoning (5) and equine motor neuron disease (1).

Congenital anomalies of the CNS made up 13 or 3.3% of cases, consisting of seven cases of hydrocephalus, three of anencephaly, two of cerebellar hypoplasia, and one of meningocele.

Neoplasia of the CNS was uncommon with only two or 0.5% of cases including an ependymoma and a neurofibroma.

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Kentucky's VSV Embargo

Throughout the summer and fall, the Kentucky Department of Agriculture's Division of Animal Health has made a very significant effort to keep Kentucky's livestock populations free of vesicular stomatitis. The Department felt it of paramount importance that Kentucky's livestock remain free of this disease because of the drastic effects such an infection would have on all of Kentucky's livestock industries.

Department officials recognized early on that for all practical purposes, a single case of vesicular stomatitis would shut down our ability to export

horses to the member countries of the European Union. In addition, it was felt that being considered a VSV-infected state would most certainly have a damaging effect on the Kentucky State Fair as well as the North American International Livestock Exposition, where an estimated 20,000 livestock are exhibited during a two-week period in November.

Kentucky's primary tool in protecting its livestock was the enactment on July 27, 1995 of an emergency regulation prohibiting the entry of all livestock, wild and exotic animals originating from any state in which vesicular stomatitis had been diagnosed, or which had been located in any such state during the previous 30 days. In addition, the regulation required that all equines coming to Kentucky from states which have a contiguous border with an affected state must test serologically negative for vesicular stomatitis during the 30-day period prior to the animal's entry into Kentucky. As of the end of November, the following states remain in the embargo: Colorado, New Mexico, Utah and Wyoming. The embargo on Texas and Arizona was lifted on November 30.

Enforcement of the embargo has been accomplished through an intensified surveillance of Kentucky's borders, where more than 500 vehicles have been stopped and animals have been inspected to ensure that they are in compliance with Kentucky's entry requirements. In addition to surveying Kentucky's borders, the Division of Animal Health increased its surveillance at specified livestock events which were determined to pose a higher likelihood of attracting livestock from embargoed areas. The Department has spent in excess of 2,000 hours at such events checking individual animals.

To date, surveillance of borders and livestock events has resulted in identification of more than 100 individuals having livestock in violation of Kentucky's Animal Health Regulations. These violations ranged from not having proper documents with the animals to evidence suggesting animals had originated from an area included in the embargo.

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