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IN THIS ISSUE

University of Kentucky
College of Agriculture
Department of Veterinary Science

LLOYD'S

Commentary

This issue of the *Quarterly* contains information on the national incidence of equine rabies and Eastern and Western encephalitis. The number of positive cases of equine infectious anemia (EIA) and surveillance data for West Nile virus in Kentucky during 2001 are also included. They serve as examples to discuss the importance, accuracy, and future development of equine disease reporting within the United States.

The practical value of disease reporting is immense. Accurate and up-to-date reports of disease incidence identify the priorities for disease research, control, and prevention in both human and veterinary disciplines.

It may be noted that apart from EIA, the equine diseases listed above are zoonotic in that they are communicable from animals to humans under natural conditions. Hence they have a significant public health impact as evidenced by the considerable investment in time and money at a federal and state level to monitor the spread of West Nile virus.

The emergence of "new" and "old" diseases in animal populations around the world has alarmed veterinary and public health authorities. Examples include bovine spongiform encephalopathy (BSE), foot and mouth disease, Nipah and Hendra virus infections, West Nile, and Japanese encephalitis. Their appearance coincides with the significant liberalization of international animal trade and animal products that include horses and equine semen.

For exporting countries to maximize the lucrative economic potential of world markets, a requirement is the establishment of a national disease surveillance and monitoring program based on guidelines developed by the Office International des Epizooties (OIE) in Paris.

Even before a surveillance program can exist, it is necessary to establish a "case definition" of each disease to be reported. A case definition incorporates the clinical and supporting evidence, usually laboratory-based, to confirm a diagnosis. For EIA this is straightforward, based on a positive Coggins or ELISA test.

Reporting EIA positives can be misleading, as an animal may be tested on more than one occasion, emphasizing the significance of animal identification in disease reporting. However, for West Nile and Eastern and Western encephalitis, the USDA and the Centers for Disease Control and Prevention (CDC) have developed case definitions that are not necessarily adhered to at state level. As a consequence, there is under- or over-reporting based on each state's varying interpretation of clinical and laboratory data.

The development of standardized diagnostic tests that are nationally approved and uniformly applied in state and regional laboratories becomes a priority. Currently many tests rely on serological detection of antibodies to a specific disease agent that may require testing paired sera, taken over an extended time interval, to confirm a diagnosis. Often a second sample is not available, leaving a diagnosis unconfirmed.

The advent of an array of molecular technologies such as PCR to detect evidence of the causal agent coupled with greater use of sophisticated serological tests, including ELISA, provides the opportunity for more sensitive and rapid diagnosis, providing the accepted case definition is adhered to.

Standardization of testing and reporting requires extensive collaboration between federal and state public health and animal health authorities. Once achieved, a national animal disease-reporting center becomes a reality. The equine diseases reported in this issue serve as a model for progress in this direction. ■

CONTACT
Dr. David Powell, (859) 257-2756
dgpowe2@uky.edu
Department of Veterinary Science
University of Kentucky, Lexington, Kentucky

Equine Disease Quarterly

Editors
Roberta Dwyer
David Powell
Neil Williams

Staff
Diane Furry
Linda Millercox
Libby Noble

Correspondence should be addressed to the editors,
Department of Veterinary Science
Gluck Equine Research Center
University of Kentucky
Lexington, KY 40546-0099
Telephone (859) 257-4757
Fax (859) 257-8542.

Internet address:
http://www.uky.edu/Agriculture/VetScience/gluck1.htm

International

Fourth Quarter 2001

Reports received by the International Collating Center, Newmarket indicated no major disease outbreaks apart from cases of West Nile virus infection occurring in the U.S.A. as reported in the January issue of the *Quarterly*.

Cases of botulism were reported on several premises in Switzerland. The respiratory form of equine herpes virus infection was widely reported among several breeds of horses in France and was involved with equine rhinoviruses in a limited outbreak of respiratory disease among racehorses in Hong Kong.

Individual cases of equine herpes virus type-1 abortion (EHV-1) were diagnosed in Germany, Ireland, United Kingdom, and the U.S.A. in central Kentucky.

Several countries experienced outbreaks of equine type-2 influenza, including Denmark and Sweden among Standardbred horses, France among several breeds, and Ireland and United Kingdom each with a single outbreak on premises containing primarily unvaccinated non-Thoroughbred animals.

Switzerland continued to report clinical cases and serological evidence of piroplasmosis infection to *Babesia caballi* and *equi* among horses.

Reports of strangles came from Australia, Ireland, Switzerland, and Sweden. ■

Simarouba Poisoning in Horses — Japan

Exposure to wood shavings of a plant belonging to the genus *Simarouba amara* in the family *Simaroubaceae* caused a disease clinically characterized by erosive stomatitis in horses at a riding club in Kyoto Prefecture, Japan.

The first recognition of the disease was on June 3, 2000, when 26 of 28 horses developed erosive lesions in the oral cavity, around the nose, lips, and anus, and on the tongue within 48 hours. A few horses showed depression and pyrexia. Two horses died on June 6 and 11, and the initial fatality was autopsied at the Livestock Hygiene Service Center (LHSC).

Autopsied samples as well as blood samples, nasal swabs, and swabs of erosive lesions were sent to the Epizootic Research Station (ERS) of Equine Research Institute, Japan Racing Association (JRA), for microbiological and pathological studies. Additional serum samples collected two weeks later were sent to the ERS.

Serological studies eliminated vesicular stomatitis virus, equine arteritis virus, equine herpesvirus 1 and 4, getah virus, adenovirus, rotavirus, and rhinovirus infections, and no virus or bacteria was isolated. Pathological findings and biochemical-hematologic analysis suggested the possibility of poisoning; fatty degeneration of liver, necrosis of hepatic cells, and degeneration and necrosis of urinary tubules were observed in autopsied samples. Hyper-bilirubinemia as well as a rise of hepatic enzymes were detected in blood samples.

An epidemiological survey conducted by LHSC and JRA revealed that wood shavings made from lumber called "Caixeta" imported from Brazil and "Ayous" from Cameroon were introduced on June 2. Two horses not exposed to the new wood shavings remained healthy. Caixeta was reported to cause erosive stomatitis among horses in Argentina in 1998. Ayous is a plant belonging to the genus *Triplochiton scleroxylon* in the family *Sterculiaceae*, which has been reported to cause asthma and dermatitis in humans.

To examine the toxicity of Caixeta and Ayous, two horses were each fed pelleted feed mixed with wood shavings of Caixeta or Ayous. Horses exposed to Caixeta developed erosions in the oral cavity within 48 hours post-exposure, and symptoms reached the peak level on day 4 when erosive lesions were observed on the tongue and around the nose and lips. Hyper-bilirubinemia and a rise of hepatic enzymes were also detected in blood samples from both horses.

On day 4, one horse developed incoordination, lowered rectal temperature, perspiration, and intermittent tonic spasm, and was euthanized. Lobar necrosis of the liver and swelling of the kidney were noted on gross autopsy examination.

Pathological findings suggested that a toxic substance contained in Caixeta caused severe damage to the liver, kidney, and immune system. From day 5, Caixeta shavings were removed from the feed and the remaining horse recovered completely by day 9. No clinical signs were observed in two other horses exposed to Ayous for 7 days.

The results suggested that wood shavings of *Simarouba amara* were the cause of the disease condition. ■

CONTACT
Dr. Tomio Matsumura
tomats@epizoo.equinst.go.jp
Epizootic Research Station
Equine Research Institute, Japan Racing Association

National

Rabies — 2000

Excellent national surveillance on animal and human rabies cases is provided by the Viral and Rickettsial Zoonoses Branch of the Centers for Disease Control and Prevention. Yearly comprehensive reports are published in the *Journal of the American Veterinary Medical Association* which provides factual information on animal and geographic distribution of rabies.

During 2000, 7364 cases of animal rabies were reported in Puerto Rico and all states except Hawaii, which is rabies-free. This represents an increase of 297 from cases reported in 1999. **Figure 1** shows the distribution of 52 equid cases, a decrease from 65 in 1999.

The raccoon rabies epidemic is ongoing along the eastern seaboard, and has not extended west beyond the geographic barriers provided by the Ohio River to the north and the Appalachian Mountains in the south.

More than 1200 cases of bat rabies were reported from the 48 contiguous states, representing a 25% increase over 1999. Twenty different species of bats tested positive. Four fatal human cases of rabies were reported from California, Georgia, Minnesota, and Wisconsin, all attributed to bat rabies.

Essentially all horses in the U.S., except Hawaii, are at risk for rabies exposure. Excellent vaccines are available for horses and are the first line of defense. ■

CONTACT
Dr. Roberta Dwyer, (859) 257-4285
rmdwyer@uky.edu
Department of Veterinary Science
University of Kentucky, Lexington, Kentucky

EEE/WEE in 2001

Eastern equine encephalitis (EEE) and Western equine encephalitis (WEE) are mosquito-borne viral diseases, primarily affecting horses east and west of the Mississippi River, as their name implies. The Centers for Disease Control and Prevention (CDC) last reported cases of EEE and WEE in horses, other animals, and humans in 1997. Since then, only summaries of human encephalitis cases are reported by CDC. These numbers likely underestimate the human cases since viral encephalitis is not a reportable disease in all states.

In 2001, the National Veterinary Services Laboratories (NVSL), Ames, Iowa tested 899 diagnostic serum samples for antibodies to EEE and WEE, and performed virus isolation attempts on 224 brain tissues or whole blood samples.

The majority of samples were of equine origin, with less than 10% of avian origin. EEE virus isolates obtained by cell culture or mouse inoculation were confirmed by complement fixation assay using Eastern, Western, and Venezuelan equine encephalitis virus reference antigens and sera. All horse brain submissions tested negative for rabies virus antigen.

Of the samples submitted, 95 horses and 2 birds had laboratory evidence of EEE infection (see **Figure 2**). All EEE virus isolates were obtained from brain tissue samples. These EEE-positive samples were negative for West Nile virus RNA by nested RT-PCR testing.

Serologic identifications of EEE cases were based on several testing procedures along with reported clinical signs and vaccination history.

Although it is rare for NVSL to receive paired serum for encephalitis testing, the combination of testing procedures, vaccination history, geographic location, and other factors lead diagnosticians to highly probable positive or negative findings.

No submitted samples were suggestive of WEE or Venezuelan equine encephalitis virus.

The NVSL testing results do not fully encompass the national picture for EEE or WEE, since not all neurologic horses are tested, some animals are tested at a state or local laboratory, and WEE is not a reportable disease to the state veterinarian's office in many states.

To obtain further information on the 2001 occurrence of EEE and WEE, state veterinarians were surveyed. More than 22 have responded to date, and additional information is included on **Figure 3**. None of the states reported WEE cases in 2001.

According to the Arbovirus Diseases Branch of the CDC, Fort Collins, Colorado, 8 human cases of EEE were confirmed in 2001. These cases were from Florida (3), Georgia (2), Louisiana, Michigan and Texas. No cases of human WEE were reported.

Because of the zoonotic nature of EEE and WEE, and the unusual occurrence of EEE cases in Wisconsin, Iowa, and Minnesota during 2001, all horses in the continental United States should be vaccinated for these diseases. Horses in the southeastern United States and in endemic areas should be vaccinated more frequently according to veterinary recommendations.

Horse owners are encouraged to have veterinarians examine all neurologic horses and submit samples for diagnostic tests. Mosquito control measures, which

Figure 1. Cases of Rabie
Horses & Mule

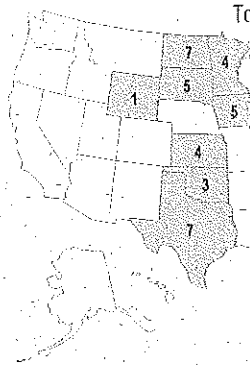


Figure 2. Eastern Equine
Positive Submission

State	Species	Sero Positive
FL	equine	15
IA	equine	0
LA	equine	2
MN	equine	1
MS	equine	20
NC	equine	5
OH	equine	0
RI	equine	1
SC	equine	3
VA	equine	1
WI	equine	21
	1 pheasant	
	1 emu	
TOTALS		69

Figure 3. Positive Repo
of Equine EEE

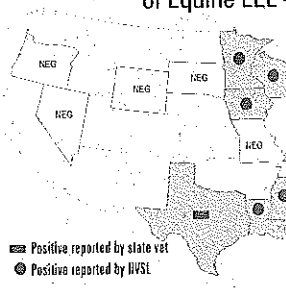
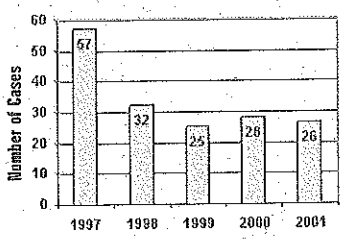
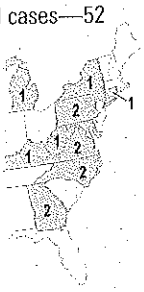


Figure 4. Umbilical Cord
Torsion Cases by Year



s in
– 2000

al cases—52



3
Puerto Rico

Encephalitis (EEE)
s at NVSL, 2001

Virus Positive	Sero & Virus Positive	Total
1	0	16
0	1	1
0	0	2
1	0	2
4	1	25
0	0	5
1	0	1
0	0	1
4	0	7
3	0	4
8 equine 2 avian	2	33
24	4	97

ts
– 2001

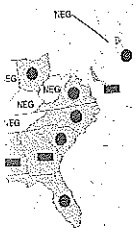
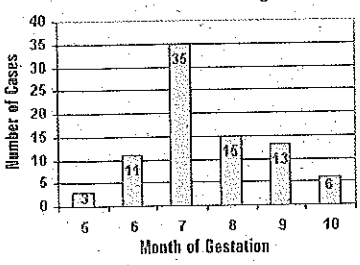


Figure 5. Number of Cases by Gestational Age



have been strongly recommended for control of West Nile virus, also serve to reduce the numbers of EEE and WEE vectors and need to be implemented. ■

CONTACT
Kathryn M. Moser, Microbiologist
Dr. Eileen N. Ostlund, (515) 663-7551
Eileen.N.Ostlund@usda.gov
National Veterinary Services Laboratory, Ames, Iowa; OR
Dr. Roberta M. Dwyer, (859) 257-4295
rmdwyer@uky.edu
Department of Veterinary Science
University of Kentucky, Lexington, Kentucky

Kentucky

Umbilical Cord Torsion

Disease conditions involving the fetal membranes (placenta) are a major cause of fetal loss and neonatal illness and include umbilical cord torsion. The umbilical cord is the fetal structure through which blood flows from the fetus to the placenta for oxygen and nutrient exchange. The cord also contains the urachus that transports fetal urine from the bladder to the allantoic sac.

Umbilical cord torsion refers to occlusion of the structures in the cord from either excessive twisting of the cord or strangulation due to wrapping of the cord around the fetus. This occlusion can result in death of the fetus, or, if only urachal obstruction occurs, the bladder may not seal properly following birth, resulting in a pervious urachus.

Care must be taken in evaluating the expelled placenta, as twisting alone is not sufficient for a diagnosis. Twisting of the umbilical cord indicates normal fetal mobility. Studies have shown that 78% of cords have twists with an average of 4.4 twists per cord. (Ginther 1992. Reproductive biology of the mare. 2nd ed. *Equiservices*, Cross Plains, Wisconsin). Twists were detected as early as 68 days of gestation and the amount of normal twisting remained constant each month of gestation.

Small fluid-filled swellings, representing urachal dilatations caused by mild obstruction of the urachus at a twist, can also be present in the wall of the umbilical cord of normal foals.

To be considered pathologic, twisting has to be excessive with occlusion of the vessels. This is evidenced by constriction of the umbilical vessels at sites of torsion, tearing of the intima of the vessels, hemorrhage into the wall of the cord, aneurysms and thrombosis of the vessels, and kinking of the cord following manual unwinding (Whitwell 1975. Morphology and pathology of the equine umbilical cord. *J. Reprod. Fert. Suppl.* 23:599-603).

The fetus is usually autolyzed since death of the fetus precedes abortion, and abnormalities of the urinary bladder may be present. Microscopic examination typically reveals mineral deposits in the blood vessels of the placenta.

Most abortions due to umbilical cord torsion occur in months 6-8 of gestation (Whitwell 1975). High fetal mobility in months 4-7 of gestation provides the greatest opportunity for torsion, with mobility diminishing greatly after 7 months (Ginther 1992).

The only identified risk factor for umbilical cord torsion is excessive length of the cord. Ninety-five percent of umbilical cords from normal Thoroughbred foalings measured between 36 and 83 cm in length with a mean of 55 cm, while cords from cases of torsion averaged greater than 85 cm in length (Whitwell 1975, Whitwell and Jeffcott. 1975. Morphological studies on the fetal membranes of the normal singleton foal at term. *Res. Vet. Sci.* 19:44-55).

The University of Kentucky Livestock Disease Diagnostic Center diagnosed 168 cases of umbilical cord torsion over a 5-year period (**Figure 4**), representing 6% of equine fetus accessions during that period. The majority was in Thoroughbreds with five other breeds represented. The gestational age of the fetuses ranged from 5-10 months with a mean of 7.5 months (**Figure 5**).

The umbilical cord lengths varied from 62 to 125 cm with an average of 96 cm. The cords typically were highly twisted with areas of constriction, edema, hemorrhage, and fluid-filled sacculations. The fetuses were slightly to moderately autolyzed, indicating death of the fetus prior to expulsion. No other changes were seen except for dilation of the urinary bladder in some cases. The principal microscopic change was deposition of calcified material in the blood vessels of the allantochorion.

Methods to prevent umbilical cord torsion are not known, and factors causing excessive cord length have not been identified. Torsion is sporadic with no apparent increased risk for future problems in mares that lose a foal due to this condition. ■

CONTACT
Neil M. Williams, (859) 253-0571
nmwillia@uky.edu
Livestock Disease Diagnostic Center
University of Kentucky, Lexington, Kentucky

West Nile Surveillance, 2001

As of November 2001, results of arboviral testing for West Nile in Kentucky indicated no human cases of 33 patients tested and 8 equine cases of 146 horses tested. Three equine cases met the case definition established by the Centers for Disease Control and Prevention (CDC). The equine cases occurred between August and October distributed over 8 counties as illustrated in **Figure 6**.

Five hundred and thirty-seven dead birds from 76 counties were submitted to the Livestock Disease Diagnostic Center, Lexington. Forty-three birds, including 14 crows and 9 blue jays, were West Nile positive by PCR from 9 counties, the majority in Jefferson and Fayette. Positive birds were submitted between September 5 and October 10.

Nine counties participated in mosquito sampling. There were 5242 mosquitoes collected, representing 25 different species. The mosquitoes were tested by PCR in pools of no more than 50 per species per county. Six positive mosquito pools, all *Culex* species, were identified in Jefferson (4) and Fayette (2) during September.

The data confirm that West Nile was active in the state of Kentucky from mid-August to mid-October. Surveillance was undertaken by the Kentucky Departments for Public Health, Fish and Wildlife Resources, and Agriculture, and the USDA. ■

CONTACT
Dr. Sue K. Billings, (502) 564 3418
Sue.billings@mail.state.ky.us
Kentucky Department for Public Health, Frankfort, Kentucky

EIA Surveillance, 2001

During the 2001 calendar year, a total of 108,351 samples were tested for equine infectious anemia (EIA) in Kentucky. Private testing accounted for 88,828 samples that were submitted to comply with state regulations regarding the sale and exhibition of equines in Kentucky and interstate transportation. This private testing resulted in three animals being identified as carriers of EIA.

In addition to the private sampling, another 19,523 samples were collected through our Market Surveillance Program or epidemiological testing. This surveillance testing resulted in one animal being identified as EIA positive.

Comparatively in 2000, 102,453 samples were tested with 6 positive animals being identified (see **Figure 7** on page 6). The testing of samples has been steadily increasing for several years, with evidence suggesting that the prevalence of this virus is diminishing among Kentucky's equine population. ■

CONTACT
E.S. Rusty Ford, (502) 564-3956
Rusty.ford@kyagr.com
Kentucky Department of Agriculture
For more information on this, or any of our other equine programs, visit www.kyagr.com/state-vet/ah/index.htm.

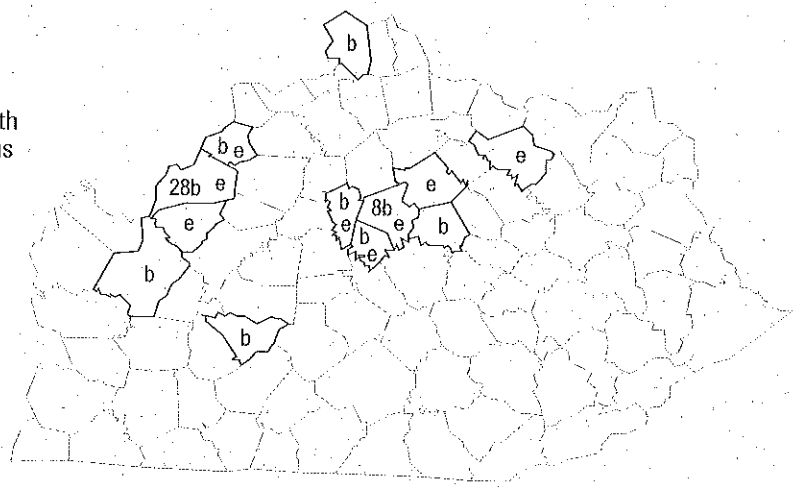
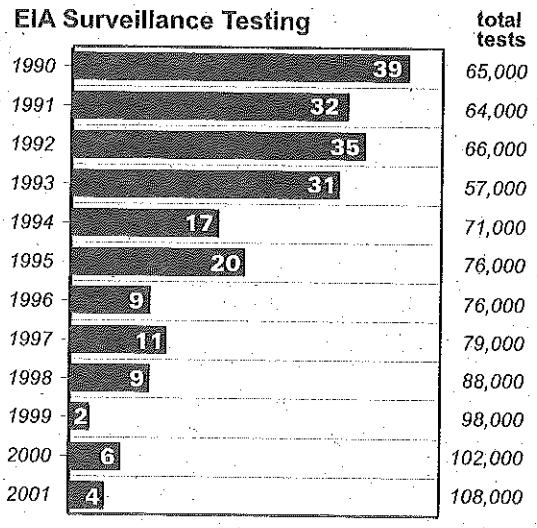


Figure 6:
Kentucky Counties with Known West Nile Virus Activity in 2001

Total Positives:
43 birds (b)
8 equine (e)

Figure 7.



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