EQUINE DISEASE QUARTERLY

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IN THIS ISSUE

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LLOYD'S

COMMENTARY

THE DECISION TO EUTHANIZE A HORSE IS often heart wrenching for an owner or manager. In most instances, it is made after careful consideration of all available options and in consultation with the attending veterinarian. After a horse has been humanely destroyed, it should be disposed of properly to prevent any possibility of disease transmission and to protect wildlife. This is especially true of animals that have been euthanized by lethal injection.

Pentobarbital, the drug of choice to end the life of a horse quickly and painlessly, is a Drug Enforcement Administration Schedule III controlled substance. When the veterinarian and owner euthanize a horse, they assume responsibility for ensuring that biosecurity is followed in accordance with federal, state and local regulations. If the animal is to be submitted to a diagnostic facility for necropsy, it is imperative that the laboratory be informed of which drugs were administered. This will aid in interpreting the findings and alert the facility to follow guidelines for disposal.

If the carcass is not submitted to a diagnostic facility and the owner chooses to dispose of the carcass, care must be taken to prevent transmission of disease and secondary poisoning of wildlife. Scavenging animals are at risk of secondary poisoning when they feed on the body of a euthanized animal. Secondary pentobarbital poisoning may occur when an animal is buried in a shallow grave or left in the open or uncovered in a landfill.

The U.S. Fish and Wildlife Service has recorded more than 130 deaths of bald and golden eagles from pentobarbital poisoning. Last year, the U.S. Food and Drug Administration added warnings to euthanasia products containing pentobarbital that they are toxic to wildlife. Animals euthanized with such a product must be disposed of properly to prevent consumption by wildlife.

Proper disposal of dead animals is also the law. Most states, including Kentucky, have regulations requiring that euthanized animals be disposed of promptly and properly. The regulations minimize the threat of disease transmission and protect other animals from feeding on poisoned carcasses. Incineration and burial are the preferred means of disposal, and regulations spell out the legal requirements of both methods.

There are penalties for failing to dispose of an animal carcass in accordance with regulations. When an eagle dies of pentobarbital poisoning from the remains of an animal that has been euthanized, the penalties can be significant. The federal Eagle Protection Act provides for penalties that include up to a year in prison and up to $100,000 in fines for individuals or $200,000 for organizations causing the death of an eagle due to improper disposal of a contaminated carcass. Last year a veterinarian and rancher in Colorado were required to pay civil penalties in connection with eagle deaths; the fines were used to defray the cost of a study to examine secondary pentobarbital poisoning throughout the United States.

Veterinarians and owners share the responsibility for the protection of wildlife as well as the humane euthanasia and disposal of fallen patients. The practice of diligent biosecurity is good for the equine community and for the wildlife that share our farms.

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INTERNATIONAL

Second Quarter 2004

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

Abortions caused by equine herpes virus (EHV-1) among vaccinated mares were diagnosed on a Thoroughbred stud farm in Argentina. Sporadic cases on several premises were recorded in France, Italy, Ireland (including two premises where EHV-4 was isolated), Japan, Switzerland, and the United Kingdom. The latter two countries reported neonatal foal deaths caused by EHV-1. Sporadic cases of paralytic disease attributable to EHV-1 were reported from two racing stables in the United Kingdom.

Respiratory disease attributable to EHV-4 was diagnosed on numerous premises in France and in an eventing stable in the United Kingdom. Coital exanthema caused by EHV-3 was identified on four premises in the United Kingdom among non Thoroughbreds following covering.

Equine influenza was reported extensively in France among several different breeds of horses, in the United Kingdom at two boarding premises, and in Central Kentucky from a recently imported Andalusian stallion while still in quarantine.

Grass sickness was reported among horses on two premises in Switzerland, which also reported clinical and serological cases of piroplasmosis. Rotavirus infection was diagnosed on seven Thoroughbred farms in Ireland.

Outbreaks of salmonellosis were reported at two veterinary hospitals in Pennsylvania and Kentucky, prompting extra biosecurity measures, including renovation, cleaning, disinfection, and bacteriological screening. Numerous outbreaks of strangles were reported from Italy, Ireland, and Switzerland.

Equine Disease Quarterly

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Equine Jet Lag

ALMOST ALL LIFE ON EARTH IS INFLUENCED by the daily cycles of light and dark brought about by the presence of the sun and the continuous rotation of our planet around its own axis. From the simplest algae to mammals, nearly all organisms have adapted their lifestyle in such a way that they organize their activities into 24 hour cycles determined by sunrise and sunset. Jet lag occurs due to an abrupt change in the light dark cycle resulting from travel across multiple time zones. This in turn causes de-synchronization between an organism's physiological processes and the environment.

The consequences of jet lag for the equine athlete have become more relevant in recent times due to increased travel of performance horses across multiple time zones for international competition. The effects of jet lag are significantly more detrimental for an athlete hoping to perform optimally in a new time zone.

All mammals possess a "master" circadian clock that resides in a specific area of the brain. Here diverse physiological processes, such as blood pressure, heart rate, wakefulness, hormone secretion, metabolism, and body temperature, are regulated. Each of these processes is in turn affected by time of day. During daylight hours, the eye perceives light, and the light signals travel to the brain where they activate a number of important genes. These "clock" genes are responsible for relaying signals conveying the time of day information to the rest of the body. Jet lag results in the acute disruption of each one of these processes.

Recent advances in the field of chronobiology have shown that a molecular clock functions in almost all tissues and that the activities of possibly every cell in a given tis-

sue are subject to the control of a clockwork mechanism, which is ultimately controlled by the environmental light-dark cycle.

Research being conducted at the Maxwell H. Gluck Equine Research Center has resulted in successful isolation of a number of "clock" genes. A comparison of these equine-specific genes with their human counterparts has revealed an unusually high similarity between these two species at the DNA level.

Based on this similarity, information on the effects of transmeridian travel derived from studies on human performance can be used to provide guidelines to horse trainers.

In human studies, results clearly demonstrate significant disturbances in heart rate, respiratory rate, body temperature, evaporative water loss, and psychological function following intercontinental flights consisting of eastward or westward journeys across multiple time zones.

One study using fit human subjects examined performance times before and after an eastward journey across six time zones. Performance times for a 270m sprint were slower for the first four days following translocation as were times for a 2.8km run on the second and third days. This can be explained by the fact that the athletes' internal body rhythms, including several neuromuscular, cardiovascular and metabolic variables, and indices of aerobic capacity, are out of synchrony with the environmental light dark cycle following a transmeridian journey.

The severity of the jet lag effects can depend on a number of factors. These include the ability to preset the bodily rhythms before flying, the number of time zones crossed, the direction of the flight, and individual variability.

Feeding schedules play an important role in entraining biological clocks, particularly within the digestive system. It is important to change both feeding times and exercise schedules to mimic the new time zone prior to travel, in order to shorten the amount of time required for resynchronization of digestive function and performance capacity upon arrival.

Lighting is also of paramount importance. Exposing animals to bright early morning light for several days prior to an eastward journey across multiple time zones—or extended hours of evening light prior to a westward journey—will help synchronize circadian rhythms to the new time zone prior to travel.

The greater the number of time zones traversed, the more severe the physiological disruption. For example, a flight from Britain to the East Coast of the United States, across six time zones, would require a significantly greater resynchronization time than a flight from the East Coast to the West Coast (three time zones) within the continental United States.

Major complications associated with long distance travel include pleuropneumonia, otherwise known as "shipping fever," dehydration, and colic. Studies carried out at Tufts School of Veterinary Medicine have revealed that even in cool conditions, horses will often lose 2 to 5 pounds of body weight for every hour they travel, as they do not like to drink while traveling. Care of horses during long distance transportation is an extensive topic that requires separate attention.

At the Maxwell H. Gluck Equine Research Center, preparations are under way to conduct several experiments that will simulate phase advances and delays in the lighting schedule of groups of horses, thus mimicking eastward and westward journeys so that the molecular and physiological effects of jet lag and the time duration of these effects can be investigated. The goal of this research is ultimately to provide practical guidelines to trainers so that measures can be taken to counteract the detrimental effects of jet lag on performance, therefore leveling the playing field for horses competing away from home.

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FIGURE 1

West Nile Virus in 2004

Equine Cases Total—515—as o

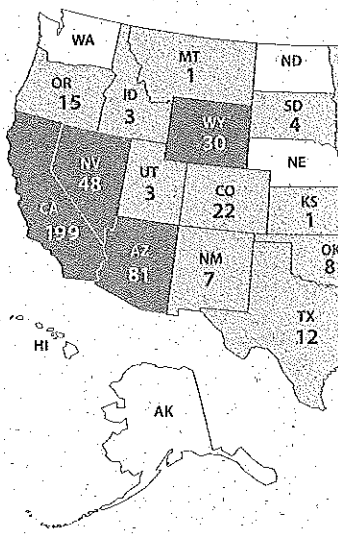
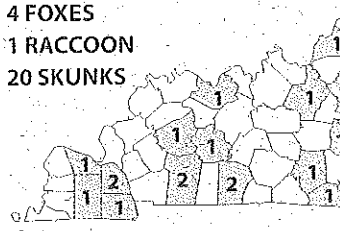


FIGURE 2

Rabies Cases in Kentucky

39 TOTAL CASES

7 BATS
1 COW
1 CAT
5 DOGS
4 FOXES
1 RACCOON
20 SKUNKS



ADAIR—1 Skunk
BARREN—1 Dog
BOURBON—2 Skunks
CALLOWAY—1 Cat
CASEY—1 Skunk
CHRISTIAN—2 Bats
CLAY—1 Bat
CLARK—1 Skunk
DAVIESS—1Dog
FAYETTE—1 Bat, 6 Skunks
GARRARD—1 Skunk
GRAVES—1 Raccoon
GREEN—1 Dog
HARDIN—1 Dog

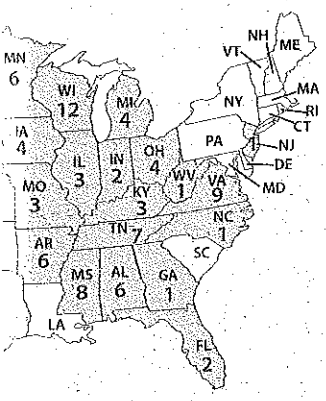
NATIONAL

Update on West Nile and Vesicular Stomatitis, 2004

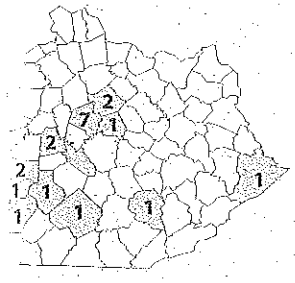
WEST NILE VIRUS HAS CONTINUED ITS INexorable spread westward across the United States and its presence is now confirmed in all states except Alaska and Hawaii. As of September 9, the USDA reported a total of 515 equine cases throughout the United States, of which 199 were in California and 81 in Arizona (Figure 1). Information on the incidence of equine cases on a state-by-state basis can be obtained from http://www.aphis.usda.gov/vs/nahps/equine/wnv/map2004.html. A similar pattern of disease dissemination has emerged in the human population with the Centers for Disease Control reporting on September 10 a total of 1,309 cases, which include 35 fatalities. Arizona reported 338 cases; California, 392; and Colorado, 195. Seventy-two cases in Arizona and California were identified following screening as presumptive blood donors.

Cases of vesicular stomatitis caused by the New Jersey strain, the majority among horses, have been reported in three states as of September 9. Colorado reported 98 premises; New Mexico, 77 premises; and Texas, 14 premises. Further information can be obtained from http://www.aphis.usda.gov/lpa/issues/vs/vs.html.

September 9, 2004



—2003



KINS—1 Bat
ERSON—1 Bat
AN—2 Skunks
ION—1 Skunk, 1 Fox
SHALL—2 Foxes
SON—1 Skunk
CER—2 Skunks
RACKEN—1 Bat
IROE—1 Skunk
ILENBERG—1 Dog
—1 Fox
ASKI—1 Skunk
OR—1 Cow

Endometrial Biopsy

IT IS WELL ESTABLISHED THAT MARES DEcline in fertility with advancing age; even mares within the window of optimal reproduction sometime suffer from reduced fertility. An important contributor to these problems is endometrial disease. Considering that a major goal of equine breeding operations is to enhance reproductive efficiency, diagnosing and treating endometritis and other forms of endometrial disease are major concerns.

A number of procedures are available to the veterinarian to evaluate an infertile or subfertile mare. These include visualization and palpation of the reproductive tract, ultrasonography, culture, hormonal profiles, and endometrial biopsy. Endometrial biopsy can yield information not obtainable by other procedures and can be an important part of a comprehensive infertility workup or breeding soundness examination. The information provided by endometrial biopsy should not be interpreted alone but in conjunction with a complete history and thorough examination.

Endometrial biopsy involves passing a long forceps through the cervix into the uterine cavity and taking small pieces of endometrial tissue for histopathologic examination. Typically, the uterine body, each horn, and any areas detected to be abnormal are biopsied. The tissue samples are preserved in fixative, processed, and sections placed on glass slides for microscopic examination. The technique is easily performed and relatively safe. Sedation is not routinely required.

The mare's endometrium is composed of an epithelial surface lining the inside of the uterus and numerous glands that lie beneath the surface. Ducts connect the glands to the endometrial surface. These glands secrete fluid with a number of functions essential for pregnancy. A loose stroma occupies the space between the glands and contains blood and lymphatic vessels. The endometrium is subject to diseases that disrupt its normal anatomy and function, rendering the mare subfertile or infertile. The pathologist or theriogenologist examining the biopsy estimates the stage of the estrous cycle and identifies any abnormalities within the endometrium. A normal endometrial biopsy in a subfertile mare points the practitioner to other causes of infertility. The major changes revealed by endometrial biopsy include inflammation of the endometrium, dilated glands and lymphatics, and fibrosis. These changes can be mild or severe and the inflammation can be acute or chronic in duration. Fibrosis is permanent and, if extensive, can carry a poor prognosis for pregnancy.

Biopsy interpretation is predictive of the likelihood that the endometrium is capable of carrying a foal to term (not merely becoming pregnant since endometrial disease can cause a pregnant mare to lose a conceptus). A scoring system was developed to allow classification and prognosis (J. Am. Vet. Med. Assoc. 172:241 262). This system makes possible uniform description and communication of changes. Based on this system, the endometrium is classified as Category I, II, or III, with Category II subdivided into IIA and IIB. A Category I endometrium is normal, or any changes are slight and widely scattered. Category IIA has slight to moderate inflammation that is diffuse or contains frequent foci. Fibrosis is mild and scattered. By comparison, a IIB endometrium has widespread, diffuse, and moderately severe inflammation with widespread fibrosis around glands that is four or more cell layers in thickness. Category III indicates widespread severe inflammatory changes, widespread or frequent severe fibrosis of glands, or severe lymphatic dilation. Changes are additive so that the presence of several changes may result in a mare being placed in a worse category. Inflammation is associated with uterine infection, contamination, antigenic stimulation, and conformational abnormalities of the reproductive tract. Longstanding inflammation can lead to fibrosis. Based on the above criteria, expected foaling rates are: Category I, 80 to 90%; Category IIA, 50 to 80%; Category IIB, 10 to 50%; and Category III, 10%. A repeat biopsy following treatment can be used to assess the effectiveness of treatment, and a mare's category can be upgraded if improvement is noted.

The endometrial biopsy must be interpreted carefully, taking other findings into consideration. It needs to be stressed that mares in even the most severe category may not be sterile, and the potential value of an offspring may make breeding attempts worthwhile. Endometrial biopsy aids the clinician in interpreting the historical and clinical information, making prognostic predictions, formulating therapeutic strategies, and evaluating the efficacy of treatment.

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KENTUCKY

Rabies in Kentucky—2003 and 2004

IN 2003, THE KENTUCKY DEPARTMENT FOR Public Health Division of Laboratory Services and the Breathitt Veterinary Center received 1,217 animal specimens from Kentucky counties for rabies testing. There were 52 (4.3%) samples unsuitable for testing because of decomposition or extreme traumatic damage to the brain. There were 39 (3.2%) specimens that tested positive for rabies; only seven (17.9% of positives) cases were domestic animals, and the remaining 32 cases were wildlife.

The total of 39 rabies cases is 34% higher than the preceding five year mean of 29.1 animal rabies cases. There were five positive dogs compared to a mean of two positive dogs per year for the preceding five years. Two of the dogs were owned, unvaccinated adults, and three were pups less than 12 weeks. There should be no rabid adult dogs in Kentucky since there is a statewide law requiring rabies vaccination of all dogs by four months of age. Rabid domestic animals almost always result in multiple human exposures, necessitating expensive postexposure treatment.

The 2003 statewide distribution pattern of positive rabies cases shown in Figure 2 may not

Rabies in Kentucky continued

be completely representative of rabies activity in the state; it may only reflect the distribution of samples submitted for testing. Almost all the samples submitted were due to some form of suspicious interaction between the animal tested and a human or domestic animal, and 88.5% of all submissions involved a bite or other physical contact with a human or other animal. For positive animals, 69.2% involved rabies exposure to a human or other animal. This possible exposure to rabid animals indicates the need for equine rabies vaccination.

As expected, skunks accounted for the majority of rabies-positive animals in Kentucky. Unlike the states east of the Appalachian Mountains, Kentucky does not have a raccoon rabies strain epizootic. The laboratories tested 128 raccoons in 2003, and only one was positive. This animal was not strain typed but came from the far western part of the state, and the rabies infection is most likely to be skunk or bat strain. However, the Centers for Disease Control and Prevention consider Kentucky at risk for the introduction of the raccoon rabies variant from West Virginia. Multiple federal and state agencies are actively engaged in preventing the spread of raccoon rabies westward from states in which it is already epizootic.

In 2004, there have been 18 rabies cases in Kentucky as of August 24. In February 2004, one horse in Marion County tested positive for rabies. Of the 18 rabies cases, there were 11 skunks, five bats, one dog, and one horse.

Additionally, the 2004 Kentucky legislature passed a bill requiring all cats and ferrets to be vaccinated against rabies. This includes barn cats. Mandatory rabies vaccination of dogs, cats, and ferrets provides another layer of protection between wildlife reservoirs of the deadly virus and people as well as horses.

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