EQUINE DISEASE QUARTERLY

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IN THIS ISSUE

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Department of Veterinary Science

LLOYD'S

COMMENTARY

THE IDEA FOR THIS COMMENTARY CAME from an offer for free brochures and posters from the Foundation for Biomedical Research (www.researchfacts.org). The poster shows photographs of survivors of diabetes, breast cancer, a kidney transplant, and heart surgery—the patients were dogs and cats. "Animal Research Saves Animals" was the poster's message.

Animal and human health research, therapeutics, infectious diseases, and diagnostic techniques are intricately interwoven and are becoming even more interlaced with the knowledge that bioterrorism agents are often diseases or toxins very well known by veterinarians. Since the outbreak of severe acute respiratory syndrome (SARS), veterinarians and animal researchers have been working side by side with medical counterparts, since coronavirus is a common animal pathogen. West Nile virus (WNV) was initially detected by a veterinary pathologist at the Bronx Zoo, and the first safe, efficacious vaccine against WNV was produced by an animal vaccine company.

HIV/AIDS research is primarily carried out by medical researchers working to make the miracle drug or vaccine, not horse researchers. Ongoing investigations into equine infectious anemia (EIA), another lentivirus, has received significant funding from human research agencies such as the National Institutes of Health because discoveries of an EIA vaccine or treatment could significantly impact the hunt for similar therapeutics for HIV and AIDS patients.

Magnetic resonance imaging (MRI) and computerized tomography (CT) scans, routinely used by medical doctors, are now being utilized to diagnose conditions not only in small animals, but also in horses. Likewise, hyperbaric chambers (used for scuba divers with the "bends") are now used to treat conditions in horses that require enhanced oxygen delivery to tissues.

Human pain management clinics have sprung up all over the United States in recent years, and small animal pain management clinics are available at colleges of veterinary medicine in the United States, often utilizing multiple modalities for acute and chronic pain. Equine pain management specialty practices are emerging outside the university setting.

Continuing veterinary education in large animal and equine programs increasingly focus on pain management beyond the use of phenylbutazone and flunixin meglumine. Of the 1,600 human infectious diseases, more than 60% are zoonotic diseases, meaning they can be contracted from animals. Several equine diseases have zoonotic potential, including leptospirosis, salmonellosis, rabies, and anthrax. Special precautions, such as wearing gloves, should be taken whenever handling fetal and placental tissues. Therapies for these diseases in humans are well documented, and many pharmaceuticals, especially antibiotics, are human drugs used by veterinarians in horses. To obtain approval and licensure for use for a single drug on one animal species, manufacturers invest millions of dollars in research and development and in trials for safety and efficacy. Often that expenditure is not cost-effective or fiscally prudent. Fortunately, veterinarians have the ability to prescribe drugs off-label for use in animals, and in fact, a significant number of human drugs are used on horses.

Human and veterinary medicine and research are interconnected in many ways. Often, supporting animal research is actually supporting human health advances as well.

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INTERNATIONAL

Fourth Quarter 2003

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

Two cases of Contagious Equine Metritis (CEM) on separate premises were diagnosed among Thoroughbreds on the island of Hokkaido, Japan, and a single case in a non-Thoroughbred stallion during routine screening in Italy.

Respiratory disease attributable to equineherpes virus was reported extensively among several breeds in France and on several premises in the United Kingdom. Single cases of equineherpes virus (EHV-1) abortion were reported from Victoria, Australia, and Hokkaido, Japan. Several cases were reported in Thoroughbreds and non-Thoroughbreds in France, and cases were diagnosed in a herd of Shetland ponies in the United Arab Emirates. Two isolated cases were reported in the United Kingdom, one in a vaccinated mare at five months gestation. Three sporadic cases of the paralytic form of EHV-1 were reported in the United Kingdom.

A mare that had returned from a farm in Ireland tested serologically positive for equine viral arteritis (EVA) in the United Kingdom during November 2003. The mare had resided on a farm in Ireland where other animals had tested positive during the year. No clinical signs were reported in the seropositive cases.

Cases of equine influenza were widely reported in France as well as cases in the south of England and Wales and in Sweden. A case of equine rabies was reported in Turkey during August. Denmark reported that isolates of *Streptococcus equi* causing strangles have been found with a low sensitivity to penicillin. Strangles was also reported from Australia, Sweden, Switzerland, and the United Kingdom.

West Nile virus continued its spread across the United States in 2003, and as a result, only four states—Alaska, Hawaii, Nevada and Oregon—are currently considered free of the disease. By the end of 2003, the USDA reported 4,636 equine cases in 41 states as compared to 14,358 cases in 40 states during 2002. The significant decrease in equine cases as compared to the increase in human cases (from 4,156 in 2002 to 9,175 in 2003) may well be influenced by the extensive vaccination program of horses in the United States.

The Bane That Is Pain

PAIN SENSATION IS A PHYSIOLOGIC NECESsity. Animals lacking the ability to sense or respond to noxious stimulation are doomed to a short, pitiable existence. Pain is best classified functionally and anatomically using a numerical system. Type I pain is sharp and intense. It is really an alarm system signaling actual or impending tissue damage and initiating responses to limit or prevent that damage. Type I pain is triggered by very hot, very cold, or very strong mechanical stimulation. The signals are carried from the periphery to the brain along a well-organized, high-speed neural pathway that permits recognition of affected peripheral areas and fast, appropriate, avoidance response. Type II pain often follows Type I pain after injury. It is not only triggered by intense thermal and mechanical stimuli, but also by chemical changes occurring in and around damaged tissues. Type II pain is carried by a slower speed neural pathway that is less well organized. As a result, this type pain is perceived as diffuse and difficult to locate. It is often described as dull, often aching or burning, sometimes with a throbbing quality. Type II pain normally persists until damaged tissues heal; its purpose seems to be one of encouraging immobility and rest to promote healing and to discourage further injury.

Painful sensory information is carried from the tips of peripheral nerve fibers (for example, in skin, connective tissue, and organs) to specific regions within the spinal cord. Here, the signals are modulated (either amplified or suppressed), and the processed pain signals, if strong enough, are sent to higher centers in the brain. Under certain conditions these pro-

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cessing centers in the spinal cord and brain can change, both in structure and in function. These regions initially become hyper-responsive to incoming signals, and normally non-painful sensations may be interpreted and passed on as painful. This is Type III pain. Actual damage to the sensory nerve axons often leads to Type III pain, but evidence is building that persistent pain (usually Type II with or without Type I) can do so as well. Type III pain is not easy to diagnose and extremely difficult to manage. In cases of severe Type III pain, euthanization of the animal often becomes necessary.

Persistent pain is not merely a symptom of another disease process; it is a disease in and of itself, putting the persistent pain patient on a slippery slope. The patient will self-splint and immobilize painful areas. These areas cease normal, symmetric, coordinated movement and de-condition. Muscle atrophy, muscle contracture, joint weakness, and neuropathies can ensue. Abnormal posture and gait can lead to overuse of ancillary musculature with resulting further overall degeneration. Severe pain is a potent stimulant of the hypothalamic-pituitary-adrenal axis, and the impact of persistent pain may be profound. Excess catecholamine production, glucocorticoid excesses and deficiencies, hypotestosteronemia, insulin-lipid abnormalities, and immune suppression have been recognized as complications of persistent pain in several species. In both animal models and in human clinical cases, problems of insomnia, attention deficit, memory loss, and cognitive deficiencies are often associated with persistent pain. Though the mechanisms by which these complications occur are unclear, they likely involve multiple effects, including neuroanatomical degeneration, neural synaptic depletion, and hormonal imbalances. Without adequate pain management, the persistent pain patient can slip into the abyss that is Type III pain.

Therapeutic approaches and modalities for managing the persistent pain patient will be discussed in the next issue of the *Equine Disease Quarterly*.

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FIGURE 1

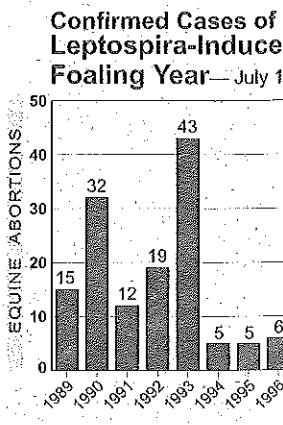
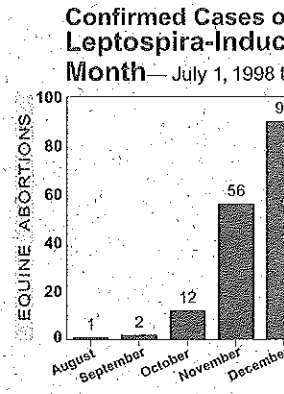


FIGURE 2



NATIONAL

Evolution of Equine Dentistry

EQUINE DENTISTRY HAS RE-EVOLVED TO become a significant part of many equine practices. In the early 1900s through World War II, most veterinarians routinely performed dental procedures for their clients. The subsequent decrease in the use of horses resulted in less teaching of equine medicine and surgery, and equine dentistry took a backseat in the curriculum of veterinary medicine.

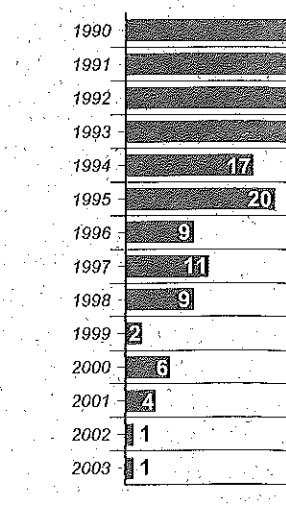
During the 1970s and 1980s, an increasing number of veterinarians expanded their interest in equine dentistry. Horse owners and trainers realized that properly performed equine dentistry had a beneficial effect on performance as well as feeding efficiency.

The increased interest resulted in demand for improved instrumentation and, more importantly, reduction of the physical labor involved using hand floats. The advent of more effective sedatives and analgesics came along at about the same time that electrical and air powered grinding discs and bits appeared.

The first equine dentistry committee was appointed in the spring of 1996 by Dr. Clyde Johnson, who was then president of the American Association of Equine Practitioners. During the past eight years equine dentistry has made enormous progress and generated great interest. A program for certified veterinary technicians to become trained in basic equine dental procedures is being developed at Murray State University in Kentucky. Several Web sites dedicated to equine dentistry are also available.

A high percentage of all procedures, including many extractions, can be performed in the

FIGURE 3



sedated-but-standing horse. More effective reshaping of abnormal teeth can be performed with electrical- or pneumatic-powered floats and grinding instruments than with hand instruments. Time needed to perform dental procedures is reduced; ease of performing them is increased.

Some studies are ongoing to determine the risks of tooth damage caused by heat that has been generated by power equipment. Due to the peculiar structure of the hypsodont (continually erupting) tooth, damage may not become apparent for several years.

Numerous theories are being presented as to what is normal tooth structure, what abnormalities are correctable, and how much correction should be done. To date, no controlled documented studies have been presented to show the benefits of aggressive rasping of the dental arcades, especially to the table surfaces of equine teeth.

Studies are needed in a number of areas. How much correction is necessary in horses less than 7 years old? When should incisor teeth be rasped back? How much correction is too much, and what are the long term effects, if any?

The greatest advances in equine dentistry may not be better drugs, instrumentation, or techniques, but more veterinarians developing an interest in improving the horse's welfare by thorough examination of the oral cavity. The horse's use, the nutrient source (i.e., pellets or pasture), age, and even genetics all play a role in what is observed when a complete oral exam is performed.

Universally acclaimed horseman Tom Dorrance was often asked about a training or behavioral problem with a horse. He always prefaced his answer with, "It all depends." Many questions about equine dentistry are being asked. Each answer brings more questions and in nearly every case, "It all depends."

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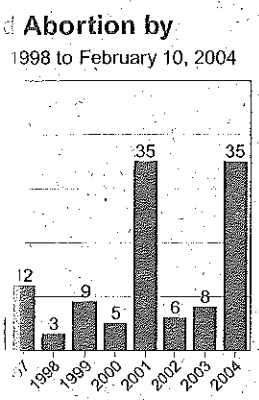

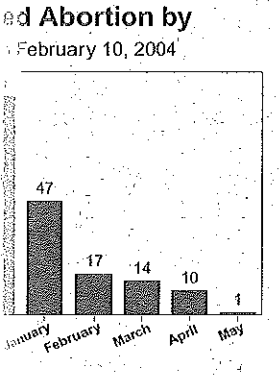

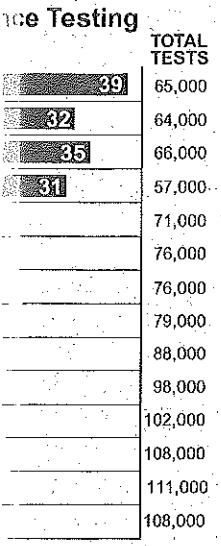

KENTUCKY

Equine Leptospirosis

SINCE THE LAST REPORT ON EQUINE LEPTOspirosis in the April 2001 issue of the *Equine Disease Quarterly*, additional cases of leptospira-induced abortion have been diagnosed at the Livestock Disease Diagnostic Center at the University of Kentucky College of Agriculture. Figures 1 and 2 show, by foaling year and month, the number of confirmed cases of leptospira-induced abortions or neonatal deaths for the past 16 foaling seasons.

Forty-nine leptospira-induced abortions have been diagnosed during the last three foaling years (2002 through February 10, 2004). Breeds of horse and number of cases involved were: Thoroughbred, 36; Quarter Horse, 5; American Saddlebred, 2; Standardbred, 2; Miniature Horse, 1; Tennessee Walking Horse, 1; and mixed breed, 2. For the three years, 35 farms had one mare, four farms had two mares, and two farms had three mares diagnosed with leptospira-induced abortions. The abortions in 2004 were all single cases except for six farms with two or three cases.

Serologic results indicated that serovar kennewicki of the pomona serogroup was responsible for 42 (86%) of the abortions, grippotyphosa for four (8%), and not determined for three (6%) of the abortions. Three abortions caused by grippotyphosa occurred during the 2003 foaling year, and one occurred during the 2004 foaling year. For the 16 years that we have been testing all equine abortions for leptospira in Central Kentucky, we have diagnosed 250 cases. Using culture results in conjunction with serologic results, we have determined that almost all the cases were due to either kennewicki (210 cases, 84%) or grippotyphosa (24 cases, 10%). The raccoon is the maintenance host for grippotyphosa. Unfortunately, the maintenance host for kennewicki

has not been determined. For additional information concerning the control and treatment of leptospirosis in horses see: Donahue, J.M. and N.W. Williams: Emergent Causes of Placentitis and Abortion. Vet Clin North Am, Equine Pract, 16:443-455, 2000.

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MRLS Pasture Monitoring Program

THE UNIVERSITY OF KENTUCKY MARE REproductive Loss Syndrome (MRLS) pasture monitoring program was established to identify and measure several important pasture parameters. Pastures were sampled on a biweekly basis during spring and early summer of the 2002 and 2003 seasons. This program has provided information on seasonal and year-to-year variation in several characteristics of Central Kentucky horse pastures.

Nitrates were seasonally higher in 2003, with 2,049 ppm reported on 3/31/03 compared to 1,266 ppm reported for the same time period in 2002. Maximum levels in individual samples ranged from 272 to 2,112 ppm (2002) compared to 444 to 2,049 ppm (2003). Reports indicate nitrate-N levels of 4,090-4,770 ppm to be safe for pregnant or lactating mares.

One early theory for the cause of MRLS was that pastures in 2001 had excessively high ratios of potassium (K) to calcium (Ca). Values for K/Ca greater than 5:1 have been suggested to lead to mineral imbalances in pregnant mares. However, further study of K/Ca ratios from past years revealed that even values exceeding 10:1 were not associated with equine abortions. K/Ca values for most sampling dates in 2002 averaged less than 6:1 for all pastures compared to less than 7:1 in 2003. Data collected in this program indicate that K/Ca ratios were not correlated to any mare health problems on monitored farms.

Levels of cyanide potential in white clover from sampled pastures were consistently higher in 2003 (359 to 1,453 ppm) than in 2002 (170 to 816 ppm). Maximum values in 2003 exceeded values reported for varieties of white clover known to have high hydrogen cyanide (HCN). No problems were observed in mares corresponding to fields with high-cyanide clover during this monitoring program.

Endophyte-infected tall fescue may vary widely in toxicity level from year to year, depending on many factors that are not well defined. Ergovaline levels in 2003 were generally lower (0.15 to 0.94 ppm) than in 2002 (0.01 to 1.55 ppm). However, levels show the same seasonal pattern, rising in late April. Interpretation of these values is not precise, since they are of selected plants in a given pasture and probably do not represent the true diet of the grazing mare.

The percent tall fescue present was noted visually in monitored pastures in both years. Values ranged from a low of 1% to a maximum of 65%. The fields monitored in 2003 generally had larger amounts of tall fescue compared to 2002. There were no reports of fescue toxicosis symptoms in any mare group.

Monitoring has provided critical background information on seasonal and year-to-year variation in several characteristics of Central Kentucky horse pastures with potential implications for animal health. Fungal mycotoxins, yeasts and mold counts, weather patterns, and poisonous plants were not associated with MRLS losses in 2002, and therefore were not included in the 2003 MRLS pasture monitoring program.

The data collected provide a better understanding of what is considered a safe equine pasture in Central Kentucky and for making recommendations to the horse industry. Further work needs to be done to understand the complex relationship between the pregnant mare and tall fescue.

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Monitoring Activities on Sentinel & Additional Farms

	SENTINEL		ADDITIONAL	
	2002	2003	2002	2003
Number of Farms	13	12	9	5
Confirmed MRLS cases	38 *(6 farms)*	0	30	1 *suspect*

2003 EIA and West Nile Surveillance and Testing

DURING 2003, 108,301 SAMPLES WERE TESTed for Equine Infectious Anemia (EIA) in Kentucky. Private testing accounted for 91,129 samples to comply with state regulations to meet interstate transportation requirements. One aged Quarter Horse gelding used for trail riding was the only animal identified as EIA positive. Another 17,172 samples were collected through our market surveillance program or for epidemiological testing. Testing of samples over past years (Figure 3) suggests a decreased prevalence of this virus amongst Kentucky's equine population. In 2002, the Kentucky Department of Agriculture amended administrative regulations so that a negative test is required within 12 months rather than six months for equids changing ownership or being offered for sale.

West Nile's Effect on Kentucky's Equine Population

During 2003, the Kentucky Department of Agriculture's Division of Animal Health investigated and reported suspected cases of encephalitic conditions affecting equids in Kentucky. Though there was an increased prevalence of Eastern Equine Encephalitis in many states within our region, it was not detected in Kentucky. Investigations confirmed 102 animals infected by the West Nile virus during 2003, an 80% reduction from the 513 equine cases reported in 2002. Of the affected animals identified in 2002, only six of the 102 were reported as vaccinated in accordance with manufacturer's recommendations, with two being euthanized. Sixty-seven survived the infection. A comprehensive study of the effect of West Nile virus on Kentucky's equine population can be found on our Web site at http://www.kyagr.com/state_vet/ah/programs/equineprogs/03westnile.htm.

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