School of Veterinary Medicine

Global Health and the Sport Horse

the impact of infectious disease on the commerce of horses

UC DAVIS School of Veterinary Medicine

Global Health and the Sport Horse

The Impact of Infectious Disease on the Commerce of Horses

And there, as I looked, was a fourth horse,
sickly pale and its rider's name was Death,
and Hades came close behind. To him
was given power over a quarter of the Earth,
to kill by sword and by famine and by
pestilence and by wild beasts . . . .

from Revelation 6:(1-8)

Albrecht Dürer
Four Horsemen of the Apocalypse
1498

April 2006

Global Health and the Sport Horse — Contributing Authors

Gregory L. Ferraro
Director
Center for Equine Health

Peter Timoney
Director
Gluck Equine Research Center

Barbara Meierhenry
Managing Editor
Center for Equine Health

Center for Equine Health
School of Veterinary Medicine
University of California, Davis
Davis, CA 95616
Director: Dr. Gregory L. Ferraro
e-mail: glferraro@ucdavis.edu
phone: (530)752-6433
Web site: ***www.vetmed.ucdavis.edu/ceh***

Gluck Equine Research Center
Department of Veterinary Science
University of Kentucky
Lexington, KY 40546-0099
Director: Dr. Peter J. Timoney
phone: (859)257-4757
Web site: ***www.ca.uky.edu/gluck/index.htm***

Published by: Center for Equine Health, School of Veterinary Medicine, University of California, Davis

Writing/Editing/Creative Design: Barbara Meierhenry

Photographs by: Katey Barrett and Lidia Nevzorova

Equine infectious disease research at the Center for Equine Health has been sponsored by: ***Dr. Bernard and Gloria Salick****, the* ***Harriet E. Pfleger Foundation****, and the* ***Bernice Barbour Foundation***

The Center for Equine Health is supported with funds provided by the Oak Tree Racing Association, the State of California Pari-Mutuel Fund, and contributions by private donors.

CONTENTS

Introduction

In a perfect world, humans and horses would be able to travel freely between states, countries and continents without the threat of illness.

In our world, this is not the case.

Indeed, some infectious disease experts believe that the world today stands on the verge of an influenza pandemic and is perhaps even more vulnerable than it was in 1918, when the "Spanish flu" killed an estimated 20 million people.* At that time, the pace and frequency of global travel was considerably less than today. The world's growing population and the speed and volume of international travel now create abundant opportunities for widespread disease transmission.

Sport horses travel long distances to compete in a single event. Breeding stock, stallion semen and fertilized embryos are routinely shipped overnight halfway around the globe.

In the past 50 years, there has been an unprecedented upswing in the growth of the horse industry around the world. In the United States alone, the horse population has increased from an estimated 6.9 million in 1994 to 9.2 million today. Moreover, the business of horses is no longer a cottage industry confined to local intrastate or interstate commerce. The equine industry reaches far and wide around the world, creating an international marketplace that depends on the rapid movement of horses and their biological products to and from distant lands. Sport horses travel long distances to compete in a single event. Breeding stock, stallion semen and fertilized embryos are routinely shipped overnight halfway around the globe. Thoroughbred and Standardbred stallions are moved seasonally between northern and southern hemispheres.

The introduction of equine influenza into the racing populations in Hong Kong in 1986, and subsequently in South Africa in 1992 and 2003, had a major economic impact on the industries of those countries, approaching $1 billion in the case of Hong Kong and an estimated $10 million with respect to the 2003 occurrence in South Africa. When contagious equine metritis, a venereal disease of horses transmitted through breeding, was introduced into the United States in the fall of 1977, it resulted in an estimated $4 million loss to the Thoroughbred breeding industry in Kentucky the following spring. Over the past 20 years alone, there have been numerous instances where stallions that were carriers of equine arteritis virus, a respiratory pathogen, which can cause a systemic illness and abortion, were unwittingly imported into the United States and were responsible for significant outbreaks around the country. Clearly, contagious diseases have the potential for causing significant losses to the economy of equine-based businesses and adversely affect the health and welfare of horses.

The single most important element for safeguarding the international movement of horses and their biological products is to prevent the spread of infectious disease among both resident and transient equid populations. Past experience indicates that the typical response of most

Continued on next page

countries to an outbreak of a disease with the potential to spread internationally is to prevent the movement of potentially affected animals across their borders. But since many diseases do not manifest immediately by illness or clinical signs, a more strategic defense is clearly needed.

Various agencies and institutions around the world—federal and local animal health authorities, equine industry groups worldwide—have been working cooperatively to develop acceptable safeguards and monitoring programs to minimize the possibility of a complete shutdown of the equine marketplace. These include:

- Developing regulations for shipping horses and equine biologicals from areas of known disease exposure to those free of such risk.

- Conducting risk-assessment analyses for importing animals from a particular country.

- Requiring pre-export and post-entry quarantine for a specified time period, during which additional laboratory testing is carried out to confirm absence of risk of infection.

- Developing research strategies to identify the modes of transmission of infectious agents so that outbreaks of dangerous diseases can be minimized or eliminated altogether.

Veterinarians, government agencies and research scientists are usually aware of these programs. Many of them are actively involved in their implementation. However, a significant number of horse owners and equine industry executives are often not informed about these programs. They may be unaware of international equine disease control measures until they are suddenly confronted with a disease outbreak that affects their own horses, or a regulatory mandate that affects the movement of their horses.

This publication is intended to provide horse enthusiasts with a better understanding of these international disease controls—what they are, why they are needed, and how they are implemented. We hope this knowledge will facilitate better cooperation and understanding between those actively involved in sport horse competition and commerce with those whose purpose is to safeguard international public health.

* ***The Threat of Pandemic Influenza: Are We Ready?*** *Workshop Summary, National Academies Press, 2005.*

Animal Health Monitoring Worldwide

The World Health Organization (WHO), well known for serving to protect human health worldwide, has been in existence for over a half century. Its goal is "the attainment by all peoples of the highest possible level of health." The World Organisation for Animal Health, known officially as the OIE (Office International des Epizooties), serves as the WHO equivalent for the protection of animal health worldwide. The OIE is comprised of 167 member nations and is charged with preventing animal disease outbreaks, including diseases that are capable of spreading to humans (zoonoses). It is the definitive advisor on animal diseases to the World Trade Organization. Since its formation in 1924, the OIE has steadily broadened its mandate to include improving the health and welfare of animals around the world.

In addition, the Animal Health Trust in the United Kingdom, through its International Collating Centre, plays an important role in monitoring and reporting the occurrence of OIE-listed and unlisted equine infectious diseases in many countries worldwide. Also, several industry-driven groups such as the Fédération Equestre Internationale (FEI), various Thoroughbred Breeders Associations, and the International Federation of Horseracing Authorities meet annually and monitor the occurrence of economically important equine diseases worldwide.

To implement its objectives, the OIE

(1) Collects and disseminates information on animal health worldwide.

(2) Develops scientifically based standards for disease assessment. Guidelines are prepared by the network of OIE collaborating centers and reference laboratories around the world.

(3) Establishes guidelines for the prevention, control and eradication of animal diseases.

(4) Safeguards world trade by publishing health standards for international trade in animals and animal products.

As an integral part of its task in monitoring the emergence of diseases that have the potential to affect animal health worldwide, the OIE has developed a list of animal diseases, including those for the horse, which by international agreement must be reported to them within a specified time frame. Rapid detection, accurate reporting and effective response to any disease, whether a new or pre-existing one, is clearly crucial to safeguarding animal health worldwide.

The globalization of the world's economy combined with the speed and volume of international transport makes the potential for cross-border spread of disease and risk of widespread occurrences greater than ever. Sound animal health policies and strictly enforced import/export regulations for horses destined for international travel serve as a measure of defense against devastating losses in our animal population.

LISTED EQUINE DISEASES NOTIFIABLE TO THE OIE

African Horse Sickness
Dourine
Equine Infectious Anemia
Equine Influenza
Equine Piroplasmosis
Contagious Equine Metritis
Western Equine Encephalomyelitis
Eastern Equine Encephalomyelitis
Equine Rhinopneumonitis
Surra (*Trypanosoma evansi*)
Glanders
Equine Viral Arteritis

Understanding Infectious Diseases

A virus is a piece of bad news wrapped up in protein.

Discussions about infectious diseases, whether in humans or animals or both, often make a distinction between an ***emerging disease*** and a ***re-emerging disease*** because it is an important piece of information for understanding the nature of infection.

An **emerging disease** is defined as a previously unrecognized infection resulting from the evolution of an existing pathogen or parasite and resulting in a change in host range, vector, pathogenicity (the ability to produce disease)) or strain. Viral diseases feature prominently but not exclusively among these types of diseases because of their ability to change or mutate and spread rapidly. Most of the recent emerging diseases have an animal origin, and almost all of them have zoonotic potential (capable of being passed to humans). Recent examples of previously unrecognized viral diseases that have emerged in human populations include severe acute respiratory syndrome (SARS) and avian influenza (H5N1).

A **re-emerging disease** is considered a previously known disease—one that has been described in the past—that either exhibits a shift in its geographical distribution or expands its host range, or significantly increases its prevalence. Once controlled and now reappearing, a re-emerging disease should be investigated to determine what factors (such as changes in climate, nutrition, health status, law, and so forth.) have allowed it to reappear. Viral hemorrhagic fevers like Ebola and Crimean hemorrhagic fever continue to reappear (re-emerge) at intervals. Tuberculosis, controlled for many years, has recently become more prevalent especially among populations of HIV-positive people whose immune systems are compromised. Rabies has recently been a cause for major concern in Eastern Europe, where several countries are witnessing an increased prevalence of the disease in animals, resulting in known fatal consequences for humans.

A comparable situation occurs with horses, as reflected by the following:

- The spread of African horse sickness to the Iberian Peninsula just before the Barcelona Olympics, as a result of the importation of zebras from southern Africa.

- The occurrence of fatal acute equid respiratory syndrome caused by the Hendra virus in horses and humans in Australia after apparently “species jumping” from its fruit bat reservoir host.

- Outbreaks of West Nile virus infection in horses, humans and other animal species throughout North America in recent years.

- Economically damaging outbreaks of neurologic disease in horses caused by equine herpesvirus 1, often despite widespread vaccination.

- The repeated occurrence of equine viral arteritis in North America and elsewhere due to the movement of carrier stallions and infective semen.

Many factors contribute to the emergence and/or re-emergence of diseases in horses. The major contributors are:

Continued on next page

Human-induced changes

• Global travel of horses by airplane is second only to people. The increased sophistication and economic importance of the equine industry have resulted in an increased demand for movement of horses for sale, competition or breeding. The result is that a disease that arises in a single individual now has the possibility of being spread to horses at distant locations, whereas in the past long voyages on ships tended to exert their own quarantine/limiting effect.

• The increasing sophistication of therapeutic drugs has created opportunities for antimicrobial resistance, hospital-acquired infectious diseases and other ill-fated effects.

Evolution and the emergence of pathogens

• Through the process of evolution, virulent strains of a particular microbe have evolved from a weaker ancestor. Microbial evolution is complex and only now are scientists beginning to define it and the selective pressures that drive the process.

• The emergence of previously undescribed microbes. Some of these arise in one species and cause disease only when they are transmitted to a more susceptible host—for example, SARS and Hendra.

Ecological changes

• Climate change has had an inevitable impact on the spread and distribution of arthropod-transmitted diseases. The spread of arthropod vectors (ticks, mosquitoes, etc.) carries a significant risk of introducing foreign diseases. For example, the Asian tiger mosquito (*Stegomyia albopicta*) is a very aggressive feeder and now constitutes an important potential vector of diseases like West Nile encephalomyelitis and Dengue in the United States since it was introduced in 1985. Similarly, *Culicoides imicola* appears to have recently spread throughout the Mediterranean Basin perhaps as a result of climate change, leading to a massive and unprecedented occurrences of bluetongue in the region. African horse sickness (AHS) has the same epidemiology as bluetongue and uses the same insect vector in the African/European ecosystem. Thus, much of Mediterranean Europe would now appear to be at risk from AHS if it is ever introduced into the region.

• Other environmental changes such as increased use of water resources (irrigation, dams, wastewater), environmental pollution, disruption/alteration of native flora and fauna, and blurring of the urban/rural interface all create opportunities for the emergence of new pathogens.

By considering all the above-mentioned factors, researchers can begin to understand the epidemiology and pathogenesis of many diseases of concern and thereby develop the diagnostic technologies for detecting each one as well as effective prevention and/or therapeutic strategies for their control.

Major Health Threats Posed by the International Movement of Horses

As stated earlier, horses are second only to people in volume of global airline travel. The increasing sophistication and economic importance of the equine industry have resulted in an increased demand for the movement of horses for sale, competition or breeding. For example, Thoroughbreds and Standardbreds are are now routinely shuttled between the northern and southern hemispheres for breeding purposes. The result is that a disease that arises in a single individual now has the possibility of being spread to horses at distant locations. Consequently, no continent or individual country can expect to be remote from the risk of any group of diseases existing in another.

There are numerous examples of emerging and re-emerging diseases in horses that today could put a stop to all international movement of horses. Described below are a few that are of the greatest concern.

African horse sickness (AHS) is a viral disease that is transmitted by an arthropod (midges or *Culicoides)*. It is a disease of sub-Saharan Africa where it continues to cause major losses. The virus also periodically has spread into North Africa and into both the Iberian Peninsula (comprising Spain and Portugal) and the Middle East. The outbreak of AHS in Spain prior to the Barcelona Olympics caused much concern in the global equine community because of the difficulty in bringing such outbreaks under effective control based on its mode of transmission.

AHS is a devastating disease that is characterized by rapid respiratory or circulatory failure in affected horses. The case-fatality rate can be as high as 95%. Major outbreaks of AHS have occurred regularly since the colonization of southern Africa. In 1855, some 70,000 horses (40% of the total population) died during a single occurrence of AHS in the Cape Colony.

Despite a variety of limitations, the AHS vaccine that was developed nearly 70 years ago has greatly reduced losses from the disease in AHS endemic areas. However, epidemics in countries outside of the traditional AHS endemic zone serve as a warning that the disease could spread to continents hitherto free of the disease—such as the United States—where there would be strong resistance to use of the South African vaccine.

AHS is not contagious between horses; infection is spread by *Culicoides* or biting midges. The distribution of the principal African vector of AHS virus (*Culicoides imicola*) recently has expanded throughout the Mediterranean Basin, placing much of southern Europe at risk for the future occurrence of AHS. In addition, related species of *Culicoides* occur throughout much of the world, including virtually all of the United States where they serve as vectors of viruses that are closely related to AHS virus. Of major importance, therefore, is whether these insect species could serve as vectors and reservoirs of AHS virus if it were to spread from its ancestral home in sub-Saharan Africa.

Continued on next page

Venezuelan equine encephalomyelitis (VEE) is a zoonotic viral disease of horses that is transmitted by mosquitoes. It causes sporadic epidemics and epizootics with a high case-fatality rate in affected horses. Between 1969 and 1971, the disease spread from Venezuela and Columbia up through Central America and Mexico and extended as far north as Brown County in Texas. Localized outbreaks due to nonepidemic strains of the virus occur occasionally among horses in Mexico.

The epidemiology of VEE infection is complex. Some strains of VEE continually circulate between mosquitoes and small rodents throughout the Americas but are avirulent (not harmful) for horses. By contrast, the epidemic strains that emerge periodically in northern South America and which can cause major disease occurrences are highly damaging to horses. VEE is characterized by severe neurological disease with a rapid clinical course and high case-fatality rate. Humans with VEE infection typically manifest influenza-like symptoms, although neurological disease like that in horses also can occur in a small percentage of individuals.

The existence of surveillance programs in endemic countries and improved vaccines has tempered concern over VEE. However, as with all arboviruses (insect-borne viruses), there is a constant risk that an epidemic subtype of the virus might emerge to precipitate another major epizootic in horses and epidemic in humans. Because horses are important amplifiers of epidemic strains of VEE, immunization is critical to preventing an outbreak and widespread dissemination of the virus. However, the presence of antibodies to VEE in horses can compromise the ability to move these animals internationally for competition or breeding.

Equine influenza. Influenza virus infection occurs commonly in various animal species, including horses. Influenza in horses is similar to that in humans. The strains of influenza virus that infect horses typically remain restricted to horses, although influenza viruses of avian origin have infrequently spread to horses and an equine influenza virus recently spread and caused disease in dogs in the United States.

Influenza infection is endemic among horses throughout most of the world except for Australia, New Zealand, South Africa, Hong Kong and Iceland, which have excluded the virus by strict quarantine procedures. Intensive surveillance is conducted in endemic countries to monitor the strains of the equine influenza virus that are circulating. Unfortunately, the quality of many vaccines varies considerably. Vaccines must be reformulated periodically to ensure that they contain the representative strains of equine influenza virus in current circulation.

Numerous instances have been documented in the last 20 years when explosive epizootics of influenza have occurred following the introduction of infected horses into susceptible populations. Even well-vaccinated horses have been susceptible when exposed to strains of the virus to which they were not immune. Thus, influenza presents a constant and increasingly complex challenge to the continued safe international movement of horses for competition and breeding.

Neurological herpes. At least five different herpes viruses are known to infect horses. Equine herpesvirus 1 (EHV-1) is the most important of these because of its ability to induce abortion and neurological disease. Typically, it causes a mild to moderately severe respiratory illness in horses, although infection of pregnant mares can result in abortion. Some horses experience severe neurological damage following infection with neuropathogenic strains of the virus that results in loss of coordination and even death. These neurological signs reflect virus-mediated destruction of cells within the brain and spinal cord. Horses of all ages and vaccination status are susceptible to this disease. Outbreaks of severe neurological herpes have occurred with increased frequency in recent years.

Vaccines for EHV-1 are available. However, while they are effective in preventing abortion and respiratory disease in horses when used in combination with good management practices, their ability to prevent the neurologic form of equine herpes is unproven. Vaccines are most effective if

they are administered prior to exposure to infection; vaccination during outbreaks is problematic and is contraindicated in outbreaks of neurologic disease. Strict quarantine procedures are typically instituted when outbreaks of neurological herpes occur among a group of horses.

Contagious equine metritis (CEM). Contagious equine metritis is a transmissible venereal disease of horses caused by the bacterium *Taylorella equigenitalis*. Undetected carrier mares and stallions are the source of the bacterium for acute outbreaks. Clinical signs of CEM are only manifest in the mare, never in the stallion. Because infection is often asymptomatic in mares, the disease can be difficult to detect and control. Initial infection in mares results in a period of temporary infertility, with or without associated clinical signs. CEM is described in greater depth on pages 22-23.

Equine viral arteritis is an infectious disease of horses caused by equine arteritis virus (EAV). The virus occurs throughout much of the world. The vast majority of EAV infections are inapparent or subclinical, but occasional outbreaks of disease occur that are characterized by a combination of influenza-like illness in adult horses, abortion in pregnant mares, and pneumonia in very young foals.

In 1984, there was an extensive occurrence of equine viral arteritis in Kentucky thoroughbreds which generated widespread concern. A number of other outbreaks have since been reported from North America and Europe. Similarly, EAV infection of horses has recently been identified in Australia, New Zealand and South Africa—countries that were previously thought to be largely free of the virus. This apparent global dissemination of EAV and rising incidence of equine viral arteritis likely results from the national and international movement of horses for competition, breeding, and trade in semen.

Equine viral arteritis is an insidious disease that is often spread by the persistently infected carrier stallion. These animals shed virus in their semen without exhibiting any clinical signs that would identify them as virus carriers, but they very efficiently transmit the virus to any susceptible mares to which they are bred, either naturally or by artificial insemination. The United States is the only country with a major horse industry that has no policy pertaining to the importation of EAV-infected stallions and thus is regarded by some as a "dumping ground" for carrier stallions from countries with specific import controls for this disease. The unfortunate owners who purchase such stallions are often shocked to find that they may not be able to move the animal or ship his semen to other countries for breeding or competition, even to the country where they originally purchased the stallion.

Vesicular stomatitis (VS) is a zoonotic (transmissible from animals to humans) viral disease of horses, cattle, pigs and other ungulate species. It occurs sporadically and seasonally in the United States with recent outbreaks in 1995, 1997, 1998, and 2003 to the present. Although the virus is known to be endemic in South and Central America and Mexico, the epidemiology of the virus remains poorly defined. Researchers are uncertain about the mode of transmission—whether by direct contact vs. vector-borne. Recent studies implicate biting midges (*Culicoides variipennis conorensis*), mosquitoes, black flies and leafhoppers as potential vectors.

VS is characerized by fever and blisters on the tongue, gums, lips, prepuce and coronary bands of the feet. The importance of the disease in cattle and swine is that it mimics foot and mouth disease, the most feared infectious disease of animal agriculture. Horses are very susceptible to VS but not foot and mouth disease virus. They are frequently the species in which VS is first recognized.

Because of international concerns for its resemblance to foot and mouth disease, animals in regions affected by VS are subject to restricted use and movement. The impact of these restrictions on the equine industry can be considerable, as exemplified by the debate over whether to cancel the Breeders Cup in Texas in 2004 because of the occurrence of VS in the state.

Photograph by Lidia Nevzorova, St. Petersburg

Animal Disease Control in the United States

The U.S. Department of Agriculture (USDA) has the primary responsibility for monitoring and controlling animal diseases and for regulating animal movement into and out of the country. They advise Congress on the development of laws pertaining to animal health and by statutory mandate implement regulations regarding animal movement and disease control.

A prominent part of the USDA's animal control function is to implement import/export policies and operate or oversee quarantine facilities. Under current regulations, horses imported into the United States must be tested for the following diseases before leaving their country of origin:

Equine infectious anemia (EIA)
Dourine
Glanders
Piroplasmosis
Contagious equine metritis* (CEM)

If the test results are negative, the horses can be imported into the United States through one of three ports of entry: New York, Miami or Los Angeles. Horses must be accompanied by a veterinary health certificate issued by a full-time veterinary officer of the national government of the exporting country stating that the horses were inspected and found to be free of these and other contagious diseases. The health certificate also must address other health requirements stipulated by the USDA and detailed in the following section, ***Importing Horses Into the United States***.

Upon arrival into the United States, all horses must spend up to 72 hours in a USDA-certified quarantine facility located at their port of entry. During quarantine, the horses are retested for EIA, dourine, glanders and piroplasmosis and must once again be proven free of these diseases. When this process is completed, geldings of any age and horses younger than 731 days of age who appear clinically healthy can be released into the domestic equine population.

Mares and stallions older than 731 days of age, not coming from a country that is certified free of CEM, must proceed from the USDA quarantine facility to a state-controlled isolation and testing facility to be certified free of contagious equine metritis. Currently, CEM testing is performed in 21 states in isolation facilities at universities and farms approved by the individual state and federal departments of agriculture.

In addition to USDA import requirements, there are federal regulations governing the interstate movement of horses and other livestock species that can affect their transport. Additionally, the official veterinarian of each state has the authority to implement specific regulations governing diseases aside from any federal requirements. Horse owners would be well-advised to familiarize themselves with the individual regulations of any state in which they reisde or intend to visit.

While these procedures are often perceived as burdensome by horse owners, the damage that potentially can be done to both the health of horses and the economics of the domestic equine industry through the introduction of any one of these diseases would be highly significant. Thus, strict adherence to regulatory statute and testing protocol is in everyone's best interest.

** Applies only to horses older than 731 days of age from CEM-affected countries imported for permanent residency in the United States. Does not apply to horses younger than 731 days of age from CEM-affected countries imported under a 90-day waiver.*

Photograph by Katey Barrett

Importing Horses into the United States

Because of the significant impact of travel on the spread of communicable diseases, legal authority exists at local, state, federal and international levels to control the movement of animals within and between jurisdictions.

Horses arriving in the United States from foreign countries are required to be quarantined for up to 72 hours at a USDA-operated quarantine facility located at the port of entry (New York, Los Angeles or Miami). A longer quarantine period may be required, depending on the country of origin. Some states also may have health requirements that are in addition to those required by the federal government, so it is prudent to check with the state of destination.

During the quarantine period, horses are retested for equine infectious anemia, dourine, glanders, and piroplasmosis. These diseases are described below. Mares and stallions older than 731 days of age from CEM-affected countries and imported for permanent entry into the United States are subsequently tested for contagious equine metritis.

Pre-entry testing is a feature that prospective importers should consider so as to avoid any last-minute unpleasant surprises upon entry of their horse into the United States.

Equine Infectious Anemia (EIA)

EIA is an infectious and potentially fatal viral disease in horses. It was first identified in France in the 1800s and has been the focus of serious attention over the years because infected horses are lifelong carriers of the virus. No vaccine or treatment exists and it is often difficult to distinguish this disease from other fever-producing diseases such as equine influenza or equine rhinopneumonitis, equine viral arteritis, or dourine.

The disease appears in three major forms: acute, chronic and inapparent infections. The acute form is problematic because the clinical signs, characterized by little else but high fever, can appear rapidly, are often indistinguishable from other diseases, and can result in death within 2 to 3 weeks. The chronic form can cause recurring bouts of illness characterized by fever, depression, weight loss and persistent anemia. The inapparent carrier form of the disease is of the most concern to regulatory agencies because these horses show no clinical signs and can serve as reservoirs for the disease.

EIA is considered a classic bloodborne infection. It can be transmitted by biting insects such as horseflies and deerflies or by contaminated medical instruments and syringes. Diagnosis is made by serological testing of blood (Coggins or ELISA tests). EIA can be controlled through minimizing or eliminating contact with infected horses. Other control measures may depend on the regulatory requirements of individual states.

Dourine

Dourine is a contagious venereal disease of horses and donkeys transmitted only by coitus and characterized by variable signs of inflammation and skin lesions of the external genitalia, progressive weakness, and eventual paralysis. Improved breeds of horses seem to be more susceptible to the disease than native ponies or donkeys. Infected male donkeys are particularly

Continued on next page

problematic because they can be asymptomatic carriers of the disease.

Dourine is caused by the protozoan *Trypanosoma equiperdum*, which is incapable of living outside the horse. Once widespread, the disease has been eradicated from many countries but still persists in Asia, southeastern Europe, South and Central America, and parts of Africa. The disease can be confused with anthrax, and clinical signs in the early disease stages often resemble those of EIA and equine viral arteritis.

The most successful control measures for dourine have been to identify infected animals and either sterilize or humanely euthanize them. Treatment is not recommended because it can result in the creation of inapparent carriers that can spread the disease.

Glanders

Glanders is an infectious disease of horses caused by the bacterium *Burkholderia mallei*. It can also affect donkeys, mules, goats, dogs, cats and humans. The disease has been seen occasionally among laboratory workers and those in prolonged contact with infected domestic animals. The United States has not seen any naturally occurring cases since the 1940s, but the disease commonly occurs among domestic animals in Africa, Asia, the Middle East and Central and South America.

Clinical signs of glanders can include localized pus-forming lesions on the skin, respiratory infections and development of septicemia (blood poisoning). More generalized signs can include fever, muscle aches, chest pain, diarrhea, and sensitivity to light.

There is no vaccine for glanders, and while antibiotics are the treatment of choice for infection, little information is available on their actual effectiveness due to the sporadic nature of the disease.

Equine Piroplasmosis

Equine piroplasmosis is an infectious, sometimes fatal disease of horses, donkeys and zebras caused by either or both of the protozoal parasites, *Theileria equi* or *Babesia caballi*. These parasites attach and destroy the horse's red blood cells. Piroplasmosis is found in nearly every country in the world except the United States, Canada, Australia, New Zealand, England, Ireland, Japan and Iceland.

Clinical signs are variable and nonspecific. Acute infections can cause fever, loss of appetite, labored breathing, and congestion. Anemia, jaundice, hemoglobinuria and signs of red blood cell destruction may also be seen. Chronic infections may be characterized, in addition to the above signs, by weight loss, mild colic, distal limb edema and exercise intolerance. Foals can be infected in utero and are weak at birth with rapidly developing signs of anemia and jaundice.

There is no vaccine for either of the parasitic organisms that cause equine piroplasmosis. Treatment of infected horses is problematic. There is no confirmatory evidence that treatment is successful in eliminating the carrier state in either infection. *T. equi* has been implicated in human infection.

Contagious Equine Metritis (CEM)

Contagious equine metritis is a transmissible venereal disease of horses caused by the bacterium *Taylorella equigenitalis*. Undetected carrier mares and stallions are the source of the organism for acute outbreaks. Clinical signs of CEM are only manifest in the mare, never in the stallion. Because infection is often asymptomatic in mares, the disease can be difficult to detect and control. Initial infection in mares results in a period of temporary infertility, with or without signs of genital inflammation.

With the exception of the United States and Australia, New Zealand and Iceland, and probably

some other countries, CEM is distributed in various countries throughout the world. The organism is known to be endemic in most European countries. Since horses are seasonally bred, the disease can have a major effect on reproductive efficiency. If CEM became established in the United States, the horse industry would experience significant economic hardship.

CEM is commonly transmitted directly during breeding between infected mares and stallions. Transmission is also possible by indirect means and by artificial insemination. Outbreaks usually occur on breeding farms following the introduction of foreign breeding stock. Mares and stallions can both be inapparent carriers. Stallions, which exhibit no clinical signs, can carry the CEM bacterium on their external genitalia for years. During the breeding season a carrier stallion can infect many mares before the disease is diagnosed. Infected mares generally experience a period of temporary infertility; rarely have abortions been reported.

Control of infection in the United States is based on isolation and testing of all imported mares and stallions over the age of 731 days that originate from countries known to have CEM. Each horse must be certified free of the causal bacterium upon arrival in the United States before it can be released into the general horse population. Horses confirmed as carriers of *T. equigenitalis* can be treated and retested. If retesting indicates successful elimination of the carrier state, the horses can be released. Alternatively, horses can be returned to their country of origin.

Photograph by Katey Barrett

USDA REQUIREMENTS FOR IMPORTING HORSES INTO THE UNITED STATES

Quarantine requirements for importing horses into the United States vary, depending on the country of origin. Moreover, import requirements and quarantine times can vary depending on current international disease situations.

With the exception of horses from Iceland, horses from the following countries are required to undergo at least a 3-day quarantine, regardless of whether they are imported for temporary or permanent entry:

Afghanistan
Albania
Australia
Austria
Belgium
Bermuda
British Virgin Islands
Czech Republic
Denmark
England
Estonia
European Union
France
Germany
Greece
Holland
Hong Kong
Hungary
Ireland
Israel
Italy
Japan
Jordan
Lebanon
Luxemburg
Malta
Mexico
The Netherlands
New Zealand
Norway
Pakistan
Poland
Portugal
Romania
Russia
Scotland
South Korea
Switzerland
Turkey
United Arab Emirates

3-DAY QUARANTINE

Horses entering the United States must be accompanied by a veterinary health certificate issued by a full-time veterinary officer of the national government of the exporting country stating that the horses have:

- Been in that country for 60 days immediately before exportation. If not, they must be accompanied by a like certificate issued by a full-time salaried veterinary officer of the national government of each country in which the horses have been during the 60 days immediately preceding shipment to the United States.

- Been inspected and found to be free of contagious diseases and, insofar as can be determined, exposure to them during the 60 days immediately before exportation.

- Not been vaccinated with a live or attenuated (weakened) vaccine during the 14 days immediately preceding exportation.

- Not been on a premises where African Horse Sickness, dourine, glanders, surra, epizootic lymphangitis, ulcerative lymphangitis, equine piroplasmosis, equine infectious anemia (EIA), contagious equine metritis (CEM), vesicular stomatitis, or Venezuelan equine encephalomyelitis has occurred during the 60 days immediately preceding exportation, nor have these diseases occurred on any adjoining premises during the same period of time.

- Not been in a country where CEM is known to exist, nor have had any contact, breeding, or otherwise with horses from such country for the 12 months immediately preceding exportation. Intact horses that do not meet this requirement AND are older than 731 days of age must enter a second quarantine for CEM testing.

- Been inspected and found to be free from ectoparasites.

Horses imported into the United States must undergo post-arrival quarantine at one of three U.S. ports of entry while tests for dourine, glanders, equine piroplasmosis, and EIA are conducted. Test results are generally available within 3 days after the date of the horse's arrival. ***Horses that test positive for any of these diseases will be refused entry into the United States.***

It is prudent to also check with the state of destination about additional health requirements that must be met. Some states have health requirements that are in addition to those required by the federal government.

7-DAY QUARANTINE

Horses presented for entry into the United States from countries that are not recognized by the USDA as being free from VEE or screwworm are required to be quarantined for a minimum of 7 days at one of the three U.S. ports of entry. Currently, this includes horses coming from all countries in the Western Hemisphere except for Canada, Mexico, Bermuda and the British Virgin Islands.

Horses will also be subject to the same requirements outlined for the 3-day quarantine.

60-DAY QUARANTINE

Horses coming from countries affected with African Horse Sickness may be imported into the United States only through the port of New York and are required to be quarantined for a minimum period of 60 days. Currently, this includes horses coming from Oman, Saudi Arabia, Yemen Arab Republic, and all countries on the continent of Africa except Morocco or horses that have stopped in or transited (passed through) these countries.

Horses will also be subject to the same requirements outlined for the 3-day quarantine.

The USDA recommends that arrangements for stall space at any of the three USDA-operated quarantine facilities be made well in advance of the shipping date. For further information, check with the USDA.

SOME GENERAL INFORMATION

Quarantine charges are variable, and prices listed on the USDA Web site (**www.aphis.usda.gov/vs/ncie**) are subject to change without notice.

Reservations at a USDA-operated quarantine facility should be made by the importer or agent with the port veterinarian at one of the following USDA-operated Animal Import Centers:

New York Animal Import Center
200 Drury Lane
Rock Tavern, NY 12575
(845)564-2950

Los Angeles Import Center
11850 S. La Cienega Blvd.
Hawthorne, CA 90250
(310)725-1970

Miami Animal Import Center
6300 NW 36 Street
Miami, FL 33122
(305)526-2926

Summary

In 1968, the U.S. Surgeon General proclaimed that the war on infectious diseases had been won. This statement was as unfortunate as it was wrong. Ongoing outbreaks of disease in humans and animals worldwide have established repeatedly that the war on infectious diseases certainly is not over. Indeed, fully one third of all human deaths worldwide still are caused by infectious diseases.

Similarly, outbreaks of time-worn infectious diseases of horses will continue to occur as surely as new diseases will continue to appear. The challenge to the equine industry is to prepare for this reality and to invest in the research that is needed to thoroughly characterize and understand these diseases and the myriad factors that lead to their emergence or re-emergence.

Research efforts must address several critical areas to ensure the protection of the international equine industry, the health of individual horses, and their continued freedom of travel. These include:

- Improving our understanding of diseases that are already known through a comprehensive characterization of the host, agent and environmental factors that lead to their occurrence. This process is critical to predicting their possible recurrence and preparing for effective control of future outbreaks.

- Developing rapid, convenient and highly accurate assays to identify these diseases.

- Developing improved vaccines and other potential therapeutic agents to prevent and control the spread of these diseases.

- Providing factual analysis and disease characterization to government agencies on which to base international animal health policies.

By understanding the factors that influence the development of disease (pathogenesis) and the frequency and distribution of disease (epidemiology), we can develop the most reliable diagnostic techniques, the most effective therapies and appropriate control strategies.

While medical science is evolving at a staggering pace, we continue to be confronted by the same diseases that existed 100 years ago—pneumonia, influenza, tuberculosis. The world's attention naturally tends to focus on animal diseases that threaten human health (zoonotic diseases). However, since few diseases of the horse fall into that category, the equine industry risks its own obsolescence if it fails to invest in research that focuses on diseases pertaining strictly to horses.

The challenge is to enable the continued unrestricted international trade in horses, semen and embryos while minimizing the inherent risk of transferring diseases to vulnerable equid populations. Such unrestricted movement requires a well-coordinated plan of action that can effectively sustain the international health of horses based on guidelines that are founded on solid scientific evidence.

Disease is very old and nothing about it has changed. It is we who change as we learn to recognize what was formerly imperceptible *(John Martin Charcot, 1825-1893).*

The world breaks everyone and afterward
many are strong at the broken places.
But those that will not break it kills.
It kills the very good and the very gentle
and the very brave impartially.
If you are none of these you can be sure
it will kill you too but there will be
no special hurry.

Ernest Hemingway, from A Farewell to Arms*, 1929*

Albrecht Dürer
Knight, Death and the Devil
1513