White Paper

Equine Disease Forum

Information synthesized from Jan. 19-21, 2016, forum in Denver, CO.: “Equine Diseases Forum”

DISCLAIMER: The information provided in this White Paper is strictly the perspectives and opinions of individual speakers and results of discussions at the 2016 Equine Diseases Forum.

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BACKGROUND

The *Equine Diseases Forum* was conducted Jan. 19-21, 2016, in Denver, CO. The forum was a first-time event that brought together eighty-six (86) equine industry professionals, including equine organization leaders, veterinarians, representatives of equine health care companies and regulatory animal health officials to gain a better understanding of equine disease issues. The forum goal was to determine what areas need to be improved to advance equine health and avoid disease outbreaks.

Over the last few years, animal health officials have been involved in an unprecedented number of equine disease incidents in the U.S. These recent equine disease events highlighted the limited knowledge among members of the equine industry regarding equine regulatory diseases; specifically, the scientific laboratory advances and changes in disease epidemiology related to Equine Herpes Virus-1 (EHV-1), Equine Infectious Anemia (EIA), Equine Piroplasmosis (EP) and Contagious Equine Metritis (CEM).[1] Additionally, the diversity and segmentation of the equine industry led to challenges as regulatory officials utilized traditional animal disease control methodologies. As demonstrated by the 2011 multistate EHV-1 outbreak, State Animal Health Officials (SAHO's) struggled with quickly controlling the disease while communicating with the segmented and diverse equine industry. Protecting the future health of the U.S. equine population will require implementation of new disease control technologies, and enhanced communications and collaborations with all aspects of the equine industry at local, state and national levels.

To address these challenges, the U.S. Animal Health Association (USAHA) Infectious Diseases of Horses Committee requested the USAHA, in partnership with the National Institute for Animal Agriculture (NIAA) host an Equine Infectious Disease Forum for equine industry stakeholders. In 2015, a planning committee was formed with members from the USAHA Infectious Diseases of Horses Committee and the Equine Committee of NIAA to move forward in the planning a 2016 Equine Diseases Forum.

NIAA is a non-profit, membership-driven organization that unites and advances animal agriculture: the aquatic, beef, dairy, equine, goat, poultry, sheep and swine industries. NIAA is dedicated to furthering programs working toward the eradication of diseases that pose risk to the health of animals, wildlife and humans; promote the efficient production of a safe and wholesome food supply for our nation and abroad; and promote best practices in environmental stewardship, and animal health and well-being.

The USAHA is a forum for communication and coordination among State and Federal governments, universities, industry, and other concerned groups for consideration of issues of animal health and disease control, animal welfare, food safety and public health. It is a clearinghouse for new information and methods, which may be incorporated into laws, regulations, policy and programs. It develops solutions of animal health-related issues based on science, new information and methods, public policy, risk/benefit analysis, and the ability to develop a consensus for changing laws, regulations, policies and programs.

The 2016 *Equine Diseases Forum* was funded in part by the USDA; Merial, a Sanofi Company; GlobalVetLink; Merck Animal Health; Zoetis™; and the Arabian Horse Association.

PURPOSE AND DESIGN OF THE FORUM

The intent of this forum was to bring together industry leaders to specifically discuss the equine health issues currently facing the industry. The objective of this unique forum was to provide the latest updates on disease threats to equine health, identify potential solutions for addressing current risks to equine health and enhance equine industry communications regarding equine health issues. Through participation in this forum, State and Federal animal health officials gained unique insight into the views of the equine industry related to equine health, which will ultimately enhance communications and future collaborations about equine disease control.

Forum Planning Committee Co-Chairmen

Dr. Katie Flynn, California Department of Food and Agriculture

Dr. Carl Heckendorf, Colorado Department of Agriculture

Forum Planning Committee Members

Dr. Ellen Buck, U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS)

Dr. Rory Carolan, USDA, APHIS, (VS)

Dr. Max Dow, Texas Animal Health Commission

Dr. Joe Fisch, Florida Department of Agriculture

Dr. Kent Fowler, California Department of Food and Agriculture

Dr. Don Knowles, Washington State University

Dr. Scott Marshall, Rhode Island Division of Agriculture

Dr. Kenton Morgan, Zoetis Animal Health

Dr. Lucas Pantaleon, Virox Technologies

Dr. Angela Pelzel-McCluskey, USDA, APHIS, VS

Dr. Grant Rezabek, Oklahoma State University

Dr. Peter Timoney, University of Kentucky

Mr. Cliff Williamson, American Horse Council

FORUM TOPICS AND SPEAKERS (in order given at the forum)

Welcome and Introductions, Dr. Katie Flynn, Equine Staff Veterinarian, Animal Health Branch, California Department of Food and Agriculture, Sacramento, CA

Overview of USDA Role in Equine Heath, Dr. Rory O. Carolan, Equine Health Team Lead, Surveillance Preparedness and Response, USDA, APHIS, VS, Riverdale, MD

National Import Export Services Overview, Dr. Ellen Buck, Equine Import Specialist, USDA, APHIS, VS, Riverdale, MD

Role of the SAHO in Protecting Equine Health, Dr. Katie Flynn, Equine Staff Veterinarian, Animal Health Branch, California Department of Food and Agriculture, Sacramento, CA

The Role of the Private Practitioner in Protecting Equine Health, Dr. Marvin Beeman, Littleton Equine Medical Center, Littleton, CO

Equine Regulatory Diseases and Lessons Learned from Recent Outbreaks, Dr. Angela M. Pelzel-McCluskey, Equine Epidemiologist, USDA, APHIS, VS, Fort Collins, CO

Overview of Infectious Diseases of Industry Importance, Dr. Nicola Pusterla, Ph.D., Diplomate American College of Veterinary Internal Medicine (DACVIM), Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California-Davis, CA

Disease Risks Associated with International Movement of Equine, Dr. Peter J. Timoney, Ph.D., Department of Veterinary Science, Gluck Equine Research Center, University of Kentucky-Lexington, KY

Horse Importation – Overview and Issues, Dr. Ellen Buck, Equine Import Specialist, USDA, APHIS, VS, Riverdale, MD

International Threat from Spread of Selected Equine Diseases, Dr. Peter J. Timoney, Ph.D., Department of Veterinary Science, Gluck Equine Research Center, University of Kentucky-Lexington, KY

Role of Equine Traceability in Protecting Equine Health, Dr. Carl Heckendorf, Colorado Department of Agriculture, Lakewood, CO

Evolution of Equine Biosecurity, Dr. Josie Traub-Dargatz, MS, DACVIM, Professor of Equine Medicine, Colorado State University and Equine Commodity Specialist, USDA, APHIS, Veterinary Services Center for Epidemiology and Animal Health, Fort Collins, CO

Historical Lessons Learned and the Future of Equine Herpesvirus Myeloencephalopathy (EHM), Dr. Jerry B. Black, Wagonhound Land and Livestock Chairman, Equine Sciences, Colorado State University, Fort Collins, CO

Equine Diseases Forum Summary and Next Steps, Dr. Katie Flynn, Equine Staff Veterinarian, Animal Health Branch, California Department of Food and Agriculture, Sacramento, CA

EXECUTIVE SUMMARY

The presentations delivered by equine disease experts resulted in a robust dialogue and exchange of information. The following highlighted issues were brought forth during the forum by the speakers and by participants in discussions associated with the forum:

1) There are increasing threats of disease outbreaks due to movement and commingling of horses of unknown disease status. Depending on the disease agent, the impacts of disease may include loss of use, death of affected horses, restrictions on equine movement, costly treatment, impact of implementation of additional biosecurity and preventative measures, trade implications and other economic impacts.

2) Current disease control measures are no longer adequate. Advancing equine health will require new methodologies, enhanced communications and collaboration.

3) The horse industry is recognized to be a diverse, multi-segmented industry. There is a lack of consistent and universal horse census and economic data about the horse industry, ultimately leading to a limited understanding of equine demographics in the United States.

4) USDA protects and improves the health, quality and marketability of our nation's horses. This is accomplished by preventing, controlling and/or eliminating animal diseases, and monitoring and promoting equine health and productivity. During equine disease outbreaks, USDA supports state and industry responses by providing coordination among states, disease-specific technical guidance, epidemiological expertise, database maintenance for selected diseases, diagnostic assistance and national-level situation reporting. USDA provides public information, fact sheets and educational outreach materials on equine diseases and disease outbreaks; they oversee the licensure of biologic products and perform national monitoring surveys. Regulations regarding equine disease are limited to restrictions on the interstate movement of test positive and/or diseased animals and the licensing of biologics and diagnostic tests.

5) The equine health roles of SAHOs are to control and prevent regulatory diseases in horses, develop and implement movement regulations, conduct epidemiological investigations, implement appropriate control measures for infected horses, report disease investigation findings, collaborate with researchers and industry to advance equine health, and provide outreach and education on equine regulatory health issues. Challenges faced by SAHO's include an increased number of equine disease outbreaks, limited equine expertise on staff in some states, limited funding for equine programs, limited Federal authority for certain equine regulatory diseases of concern, limited traceability of equine and limited ability to efficiently communicate with all segments of the equine industry.

6) The private practitioner's role in equine health is to provide expertise in disease control; advocate for the horse; monitor for early detection of disease; provide on-farm disease control and prevention (vaccination is a critical role); be a driver in acceptance of biosecurity within the industry; safeguard human health; be a liaison with regulatory officials on reportable diseases and biosecurity issues; drive research for enhanced diagnostics, treatments and control measures; collaborate with industry, regulatory officials and academia on measures to protect equine health and ensure use of practices that reduce spread of disease agents by the health

care provider. The examination of a horse by a practitioner should not create a risk for disease spread.

7) The industry plays an important role in protecting equine health by being the eyes and ears within the equine population. It is critical to contact State and Federal officials when a disease is observed to make them aware of suspected reportable diseases or alert officials of equine industry concerns. Equine industry stakeholders, including horse owners and private practitioners, should engage with State and Federal officials to provide expertise, experience and industry perspective at the local level; to obtain the latest information on equine regulatory disease information for dissemination; and to discuss best practices to use in order to protect equine health .

8) To advance equine health, equine industry leaders can promote and practice biosecurity, educate fellow industry members about equine health issues, support Federal regulations to ensure consistent management of equine diseases across the U.S., and implement industry wide disease prevention measures.

9) The importance of monitoring, surveillance and timely reporting of occurrences of certain diseases, endemic or other, needs to be emphasized by equine industry stakeholders.

10) The primary equine health regulatory concerns include limited ability to control disease (untested populations, illegal horse movement, lack of funding for testing and tracing, and lack of traceability, thus allowing disease spread) and the inability to provide adequate outreach to the equine industry (the segmented industry makes it difficult to reach every horse owner and the speed of social media vs. the speed of government agency outreach).

11) Challenges with endemic diseases include determining if the disease is of importance to the industry, if it is clinical or sub-clinical, adopting the idea “infected unless proven otherwise,” infectious doesn’t mean contagious, limited data capture from outbreaks, lack of outbreak protocols (who to test, when to test), non-horse people as owners (these owners need to be educated so they recognize what is abnormal and understand the importance of monitoring their horses health), lack of a confirmed diagnosis in clinically affected horses despite testing for known causes of disease, lack of metrics to determine impact of disease, lack of acceptance of responsibility during an incident, lack of a centralized database for disease outbreak, and lack of collection of disease data in a manner that it can be used for future studies.

12) On farm infectious disease control is a challenge. The status of a horse as it relates to contagious disease risk can’t be assumed based solely on clinical presentation. Biosecurity is considered too complicated by equine industry stakeholders and results in a lack of compliance.

13) Control and prevention of diseases is through implementation of Best Management Practices. Identification of high-risk groups for domestic diseases and understanding of disease transmission mechanisms will assist in the development of appropriate disease prevention strategies. For diseases of regulator importance, communication with regulatory officials is warranted.

14) Increased immunity through vaccination is needed for at-risk populations. Appropriate use of immunization requires an understanding of which vaccines are considered core vs. at-risk vaccines.

15) During an equine disease outbreak, there is need for immediate transparency, notifications, clear guidance and updated public information on the outbreak to inform decision-making at all levels.

16) Implementation of biosecurity practices in the equine industry has been slow. Biosecurity at both the individual horse and individual premises level is the most important method of prevention of EHM as well as many other equine diseases of concern. Widespread education and outreach within the equine industry is needed to help individual owners, trainers, event organizers and equine facility managers understand and implement appropriate biosecurity to prevent the spread of equine infectious diseases.

17) The evolution of biosecurity started with heightened awareness and continues with educational tools. Themes in biosecurity include everyone having a role; the industry taking initiative; making biosecurity simpler to understand; utilizing technology, apps and videos, and e-mails for messaging; educating owners to demand more from event organizers (create expectations in participants); and practitioners considering how best to market biosecurity plans.

18) Biosecurity needs to be applied every day – not only during an outbreak situation. However, there is no standard biosecurity control plan that applies to all situations. The key is to define disease risks and take steps to reduce the introduction and spread of disease.

19) Biosecurity plans are not one-size-fits-all; there needs to be a premises and event-specific plan to address the identified risks. Horse owners and event organizers should work with their private practitioner and SAHOs to evaluate the risks on the premises in order to develop the most suitable infectious disease control plan for their premises.

20) Equine traceability is a priority of the equine industry. The current traceability issues identified include a lack of traceability, lack of individual identification and lack of documentation of movements. Movement requirements set by the state of destination vary from state to state, leading to confusion and concern within the equine industry. The variation of enforcement of interstate movement regulations due to decreasing state funding and personnel resources places the equine industry at risk for potential disease introduction and spread.

21) The current challenge of microchipping is the lack of a centralized database for microchip information. There are currently various repositories for equine microchip data, including the microchip company, breed registries, discipline registries and private veterinary clinic records. The industry needs a mechanism to access microchip data in a timely fashion, whether it's for tracing a diseased animal or re-uniting a displaced animal with its owner after a natural disaster.

22) Current, interstate movement issues include determining the role and value of a health certificate dated within 30 days to a horse moving, the need for industry collaboration with compliance, incentive for the horse industry/owner to track horse movement, and how best to add value to a veterinary inspection (e.g. health certificate).

23) Illegal movement of horses is of great concern to the equine industry. Specifically, horses illegally entering from Mexico into the U.S. pose a significant disease risk as EIA and piroplasmosis are prevalent in Mexico. Additional international disease risks are posed when horses from other countries are routed through Mexico and then enter the U.S. illegally (or sometimes even legal).

24) Documentation of horses moving interstate is critical to traceability of horses during a disease outbreak or natural disaster. However, the documentation is only as good as the accuracy of the information recorded. The current paper-based systems are not efficient or effective for tracing animals in a timely manner. Utilization of existing and future technology is necessary for advancing the traceability of the equine population within the U.S. Horse owners are more likely to implement daily use of electronic systems that are easy and quick.

25) Requiring health certificates to enter any equine commingling point, such as equine event grounds, boarding stables and breeding farms, would help protect the health of the U.S. equine population.

26) Equine passports are available in a select few states to assist in the facilitation of horse movement. However, SAHO's are concerned with the lack of documentation of horse movements as movement itineraries are not being submitted in a timely manner (as required by the issuance of passport).

27) The international import requirements for the performance horse are not equivalent to those of other countries where U.S. horses might compete. The risk of importation of a disease is inherent as part of the international movement of horses. However, there is a need for the acceptance of reality that countries can differ widely with respect to their import requirements for horses entering a country for temporary or permanent residence.

28) The reliability of current serological tests carried out on horses imported into the U.S. should be reviewed to confirm that they are optimal-based on their test associated characteristics (e.g. sensitivity and specificity in order to ensure that horses that test negative are free from those diseases at the time of temporary or permanent importation).

29) Current regulations for the international importation of horses are narrow in focus and scope, with limited authority for additional diagnostic testing of exposed horses. Additionally, the quarantine hold periods can be as short as 42-48 hours for horses from certain regions of the world, which is less than the incubation period of many diseases of concern. Therefore, clinical disease may not be evident at the time of release as the horse may be released during the incubation period. Additional diagnostic testing beyond the designated regulatory disease tests per USDA is only permitted when deemed medically necessary. Thus, additional testing is not permitted on a horse that is "free from clinical evidence of disease while in quarantine." In addition, per USDA, there is no authority for diagnostic testing of exposed horses for non-regulatory diseases of concern to the destination state once released from quarantine facility.

30) The nature and frequency of international horse movement is influenced by changing trends in the horse industry that are primarily economically based. It has been accepted that countries

can differ widely with respect to their requirements for horses imported for temporary or permanent residency purposes. Experience has shown a need for greater awareness of risks and vigilance in monitoring for diseases associated with importation of transboundary/Foreign Animal Diseases.

31) There is a need for greater industry awareness of the possible emergence of a new/previously undiscovered infectious/non-infectious disease. The importance of monitoring, surveillance and timely reporting of occurrences of diseases, endemic or other, cannot be over-emphasized.

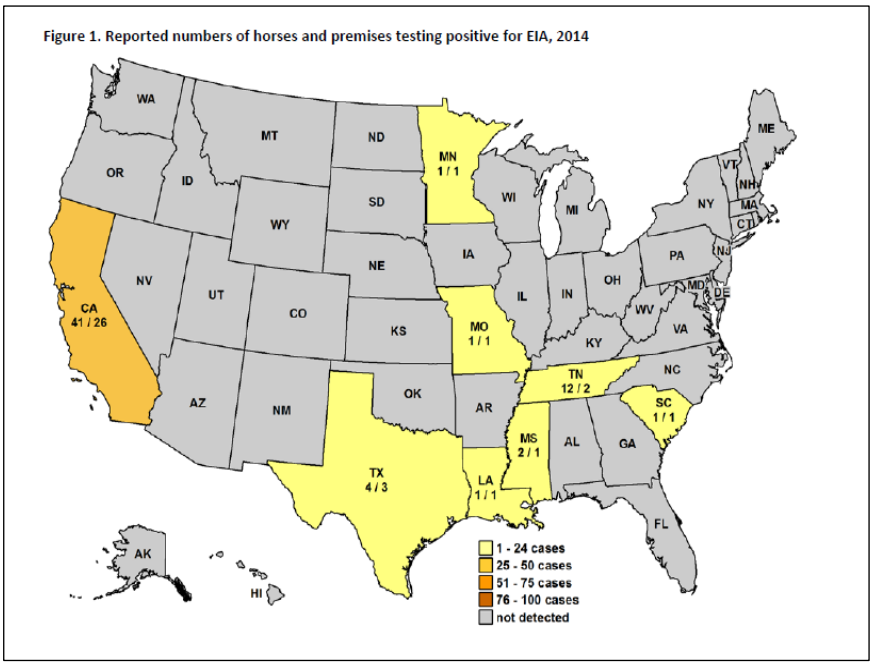
PRESENTATION HIGHLIGHTS

ROLE OF USDA IN PROTECTING EQUINE HEALTH

EQUINE REGULATORY DISEASES AND LESSONS LEARNED FROM RECENT OUTBREAKS

Regulatory diseases are those diseases reportable by law to State or Federal animal health authorities, and include Foreign Animal Diseases and infectious diseases that are internationally reportable to the World Organization for Animal Health (OIE), other contagious or infectious diseases that have an existing control or eradication program, and diseases that threaten the national herd either by their clinical features or their impact on international trade.[2]

Regulatory diseases frequently encountered in the U.S. include Equine Infectious Anemia (EIA), Equine Viral Arteritis (EVA), Eastern Equine Encephalitis (EEE) and West Nile Virus (WNV).



EIA is a viral, blood-borne disease, with clinical signs including fever, weight loss, yellowing of mucus membranes, anemia, swelling of limbs and possible death. Transmission occurs through blood-sucking flies and iatrogenic means (human-caused) via needles and syringes, and dental and surgical instruments. Transmission can also occur from mare-to-foal and during breeding from use of infective semen. If a horse survives the acute clinical signs of EIA, it becomes a life-long carrier of the virus and is a source of exposure for other horses. Currently, no vaccine or treatment exists for EIA. Each state has its own regulations and movement requirements for EIA; Federal regulations control only the quarantine and movement of reactors (confirmed EIA positive animals) between states and approval of laboratories performing EIA testing. Current issues related to EIA include limited Federal regulatory authority leading to inconsistency across states, high risk populations (untested herds, horses moving illegally from Mexico into the U.S. and iatrogenic spread in Quarter Horse (QH) racehorses), over-testing in the same known negative populations and the need for the industry to give input on next steps.[3]

EVA is a viral disease that causes abortion, respiratory issues, fever, depression, swelling of the limbs, decreased fertility and can cause death. It is an airborne disease that spreads through the respiratory system through close contact, and can be transmitted to mares through the use of infective semen from shedding stallions. It is possible for horses to be in a chronic carrier state and to shed the virus intermittently. There is a vaccine for the prevention of the spread of EVA, and it is used extensively in Thoroughbred (TB) stallions. Current issues with EVA include limited surveillance (some export testing,

mostly passive surveillance in response to acute clinical signs), outbreaks that are difficult to control due to respiratory spread and through use of cooled shipped semen, modified live vaccine that requires isolation of horses for a period after immunization, difficulty differentiating vaccinated vs. exposed animals when a vaccination certificate is lost, and lack of awareness outside the TB industry.[4]

EEE and WNV are both arboviruses spread primarily by mosquitos that produce severe neurologic disease in horses that is often fatal. Both disease agents are also transmissible from mosquitos to humans, but aren't transmissible from horses to humans – horses are dead-end hosts of both diseases. Vaccination is highly protective for horses, but regular booster vaccinations are necessary. Additional current issues with EEE and WNV include cases in unvaccinated or inadequately-vaccinated horses, trends towards an increase in cases during economic downturns (reduced use of vaccine during economic "lean" years), and under-reporting of cases as case definition requires diagnostic testing.[5]

In addition to these more common endemic regulatory diseases, lessons have been learned from "high-impact" or "high-consequence" regulatory diseases that have occurred in recent years. Diseases considered "high-impact" or "high-consequence" have one or more of the following characteristics:

- Result in high morbidity or high mortality
- Have the potential for human health implications
- Are Foreign Animal Diseases
- Are domestic diseases with new, increased or unexpected virulence
- Are diseases with limited intervention options
- Produce severe or debilitating trade ramifications
- Cause outbreaks that impact large numbers of horses, owners and/or premises
- Elicit a palpable level of concern or panic in the equine industry.[6]

Recent examples in the U.S. include EP, Vesicular Stomatitis (VS), CEM and EHM.

EP is usually a life-long infection by the hemoparasites either *Babesia caballi* or *Theileria (Babesia) equi*, although there is an experimental treatment available which has had some success in permanent clearance of the organism. The causative agents of EP are spread by certain species of ticks or exposure to infected blood/blood products, and EP is considered a Foreign Animal Disease in the U.S. Mare-to-foal transmission can occur, but is uncommon and not an efficient mechanism of transmission. Clinical signs include fever, lethargy, inappetence, anemia, icterus, colic, weight loss, exercise intolerance, sudden death or no signs at all. EP is endemic in tropical/subtropical areas of Mexico, Central/South America, Africa, Asia, Middle East, Europe and the Caribbean.[7] U.S. import procedures require that all horses except those from Canada and Iceland be tested negative for EP at the U.S. import center prior to entry. A complement fixation test (CFT) used for importation prior to August 2005 is known to yield false negative results during the chronic phase of the disease. A competitive enzyme-linked immunosorbent assay (cELISA) test was developed to better detect chronically infected horses. Currently, both the cELISA and the CFT are used at importation to assure both chronic carriers and more recently infected horses are detected at import.

EP has been identified in three distinct populations in the U.S.: a single Texas ranch outbreak that has since been resolved, horses imported to the U.S. prior to 2005 and in QH racehorses (mostly with ties to unsanctioned racing). After the 2009 detection of tick-transmitted *T. equi* on a ranch in south Texas, states began imposing movement testing restrictions on each other. New Mexico initiated EP testing in QHs participating in sanctioned racing after two small outbreaks of EP-positives in unsanctioned race clusters were detected. Subsequent additional positive findings in these QH racehorses led to more states imposing EP testing requirements to enter race tracks. To establish that the disease was not

present in QH show horses, the American Quarter Horse Association (AQHA) required EP testing for horses participating in AQHA World Show series events in 2011; no positive horses were found in that population. To-date, more than 292,000 U.S. horses have been tested for the presence of EP agents since November 2009 and 262 positives have been found, primarily in the QH racing population, with a smaller number of the positives being previous imports. The following important lessons have been learned from recent EP findings: 1) Natural, tick-borne transmission of EP has been proven to be rare in the U.S. and is likely to be sustained and efficient only in certain geographic areas if infected horses are allowed to remain there; 2) EP transmission via iatrogenic means is causing ongoing transmission in the U.S. QH racing industry[8]; 3) Surveillance testing and educational outreach in high-risk equine populations is the most effective way to mitigate iatrogenic spread of EP; 4) Treatment continues to be a promising exit strategy in the U.S.; and 5) Surveillance in QH racehorses is declining and may not be adequate to find infected horses before they move to other sectors of the industry.

VS is a viral disease that mostly affects horses, cattle and swine, but can also affect small ruminants. VS causes the formation of vesicles (blisters), usually seen on the tongue, lips, around other areas of the mouth or nose, on the udder or sheath, and/or along the coronary bands (e.g. just above the hooves). Eventually, the vesicles rupture and the secretions from the ruptured vesicles contain the VS virus. VS outbreaks have caused severe international trade implications and humans can occasionally contract the disease from handling infected animals. The main routes of transmission of VS include biting flies (black flies, sand flies and biting midges), direct contact with ruptured blisters of affected animals, or contact with areas/objects recently contaminated with the virus, such as shared water troughs, feed buckets and other contaminated surfaces. Control and prevention of VS includes the quarantine of infected premises, isolation of lesioned animals, premises-level vector control and enhanced interstate movement restrictions during an outbreak.[9] Lessons learned from recent VS outbreaks include that planning and preparedness is important as large scale outbreaks can be a huge resource drain; education and outreach materials are needed for horse owners and private practitioners; more specific planning is needed for shows and events; responsiveness to calls and quarantine releases are key to owner compliance; there is a need for timely, regular updates on the outbreak and the affected areas; and interstate/international movement requirements can be highly confusing and could benefit from standardization.

CEM is a venereal disease that was first reported in England and Ireland in 1977, and was subsequently identified in many other countries. Significant CEM outbreaks in the U.S. have occurred in 1978-79, 2006 and 2008-2010. A Foreign Animal Disease, the U.S. requires strict testing on horses imported from CEM-affected countries, both prior to entry and post-entry. The disease is caused by the bacterial pathogen *Taylorella equigenitalis* and clinical signs in mares include copious vaginal discharge and infertility. In stallions, there are no clinical signs.[10] CEM is a treatable condition with specific antibiotics and procedures. While the causative organism is highly contagious via live cover breeding, transmission also occurs by direct contact with fomites and inadequate biosecurity at semen collection facilities. The organism contaminates collected semen and can be effectively transmitted to mares through artificial insemination (AI). Transmission from mares to foals has been documented to have occurred, although it is unknown whether the exposure is in utero or during the birthing process. U.S. import requirements include post-entry testing of stallions and mares from CEM-affected regions, which occurs at approved CEM quarantine centers in the U.S. (private facilities monitored by State/Federal oversight). A large multistate CEM outbreak in the U.S. that occurred from 2008-2010 resulted in 23 infected stallions, 5 infected chronic carrier mares, and involved the testing of more than 1,000 exposed horses in 48 states. The epidemiological investigation revealed extensive stallion-to-stallion transmission via contaminated equipment at semen collection facilities/clinics and transmission to mares via artificial insemination (A.I.), despite appropriate antibiotics being used in the semen extenders. The source of the outbreak

was determined to be a stallion previously imported to the U.S. in 2000 and the disease agent was found to have spread to horses in the U.S. over a 10 year period of time. Lessons learned from this recent CEM outbreak include 1) Despite CEM quarantine and rigorous testing of imported horses, outbreaks have occurred across many different breeds and disciplines; 2) The sheer volume and frequency of equine movements lead to continued spread without adequate biosecurity; 3) Testing of exposed horses during large-scale CEM outbreaks is difficult and expensive for everyone involved; 4) There needs to be good domestic disease surveillance to detect Foreign Animal Diseases; and 5) Education and outreach to the industry needs to be an ongoing effort, and include biosecurity in breeding practices and testing of active breeding stallions.

EHV-1 infection, or rhinopneumonitis, can result in respiratory disease, reproductive disease and/or significant neurologic signs, which is called EHM. It is spread by airborne/respiratory routes and through direct contact. It can be caused by either the wild-type strain or neuropathogenic strain of the EHV-1 virus and requires supportive care and potential treatment with antiviral drugs. EHM cases that are not responsive to treatment may result in death by euthanasia. There are multiple EHV-1 vaccines licensed in the U.S. that carry a label claim for the prevention of the respiratory or abortive form of the disease, but none of the current EHV-1 vaccines carry a label claim for prevention of EHM. A multi-state outbreak of EHM associated with horses having attended a cutting event in Ogden, Utah, in 2011 (see page 31 for more information) led to many lessons learned, including the following: 1) Frequent and widespread movement of horses in the U.S. is a significant risk factor for continued EHM outbreaks; 2) Biosecurity at both the individual horse and individual premises level is the most important method of prevention of EHM; 3) Widespread education and outreach within the equine industry is needed to help individual owners, trainers, event organizers and equine facility managers understand and implement appropriate biosecurity to prevent the spread of EHV-1; 4) During an EHM outbreak, there is need for immediate transparency, notifications, clear guidance and updated public information on the outbreak to inform decision-making at all levels; and 5) Differences between states on reporting and response measures for EHM have been a challenge for adequate response and prevention of continued disease spread.

Overarching lessons learned from all of these recent outbreaks include the following: 1) The equine industry is vast and highly segmented, independent by nature, composed of individuals with varying levels of awareness and knowledge of infectious diseases and their control, but composed of people with a high level of compassion for the horse, which should be leveraged; 2) There is a need for planning/preparedness and educational outreach at all levels via use of many different methods to provide the necessary background for infectious disease prevention and response; 3) There is a responsibility for all involved in disease outbreaks to communicate and share accurate information in a timely matter; and 4) There is a need for more interaction between the equine industry groups, private practitioners, and State/Federal animal health officials to manage and respond to equine disease threats.

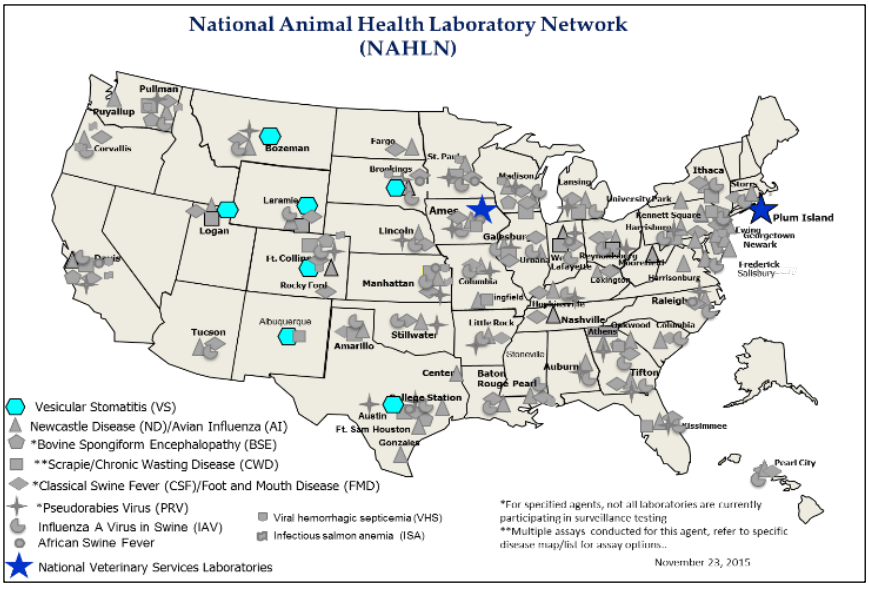
OVERVIEW OF USDA ROLE IN EQUINE HEALTH

A study commissioned by the American Horse Council in 2004 reported 9.2 million horses in the U.S., with $39 billion in direct economic impact. In 2012, Kentucky's equine industry had a statewide economic impact of almost $3 billion and generated 40,665 jobs. Global trade in horses in 2014 was approximately $2.4 billion and the value of horses exported by the U.S. totaled $456 million, which puts the U.S. as the world's leader in equine exports by value. The value of U.S., live, exported horses exceeds the combined value of live cattle, swine, sheep and goats, and is double the value of all exported live poultry. [11]

Regulations are very limited regarding control of equine diseases compared to other livestock, yet there have been some very costly and impactful disease outbreaks where industry and/or SAHOs have requested help from USDA in their management. USDA support and infrastructure is often less visible to the equine industry, but is no less important. USDA supports state and industry responses to equine disease incidents by providing coordination among states, disease-specific technical guidance, epidemiological expertise, database management, diagnostic assistance and approval for biologic products (including vaccines). USDA also creates reports and generates information to allow stakeholders to be aware of disease characteristics and disease outbreaks. USDA's support/response is coordinated by the Equine Health Team, working closely with USDA district or field offices and staff. Surveillance, preparedness and response equine activities include responding to equine health incidents, conducting epidemiological investigations, providing timely and accurate tracing and information, disease monitoring and surveillance, and specific health planning.

Disease response can only be accomplished with an extensive animal health infrastructure that includes:

- USDA district/field staff
- National Veterinary Services Laboratories: International and national reference laboratories, diagnostics, Foreign Animal Disease investigations, laboratory approvals, consultation and support expertise, maintenance of EIA herd to be used for test validation purposes
- Center for Epidemiology and Animal Health: Strengthen animal health infrastructure; provide timely and accurate information and analysis; provide surveillance, monitoring, risk analysis, spatial epidemiology and modeling; includes the National Animal Health Reporting System, National List of Reportable Animal Diseases and National Animal Health Monitoring System (NAHMS)
    - National Animal Health Laboratory Network: Creates a strategy to coordinate national animal disease surveillance and testing, expands laboratory infrastructure, is activated during large-scale outbreaks (thousands of samples require testing) and combines State/university/Federal cooperation and communication



- NAHMS: Equine activities include a series of three studies conducted in 1998, 2005 and 2015-2016. Objectives of the 2015-2016 study include trends in equine care and health management, occurrence and management of owner reported lameness, health practices for important equine infectious diseases, health related costs of equine ownership, evaluation of control practices for gastrointestinal parasites, evaluation of ticks and tick-control practices, collection of sera and the creation of a serum bank for future studies
- Center for Veterinary Biologics: Licenses and regulates veterinary biologics; ensures veterinary biologics are available for diagnosis, prevention and treatment; adverse event reporting

- Agricultural Research Service: Develops and validates EP diagnostics, evaluates efficacy of EP treatment, conducts VS and insect vector research
- National Veterinary Accreditation Program: Informs and trains veterinary practitioners about regulatory diseases and other infectious disease matters; monitors interstate and international movement; protects public health; includes oversight of almost 65,000 accredited veterinarians, of which more than 5,000 are equine veterinarians; and provides equine-specific training online and in lecture format at veterinary conventions
- One Health: Concept that the health of animals, humans and the ecosystem are linked – that healthy, productive livestock and companion animals lead to healthy people and a sound environment; equine surveillance data on arboviral infections are reported through SAHO in collaboration with the Centers for Disease Control
- Animal Disease Traceability: Tracks where diseased and at-risk animals are, where they've been and when they were there; important to ensure a rapid response when animal disease events take place; reduce the number of animals involved in an incident; reduce the time needed to respond; and decrease the cost to producers and the government
- National Preparedness and Incident Coordination: Creates strategies and policies for effective incident management and acts as a liaison to coordinate incident response
- National Veterinary Stockpile: Logistics center; protects food supply; holds vaccines, antivirals, supplies, equipment and response support for use in high-impact animal disease incidents
- Investigation and Enforcement Services: Investigates potential violations of USDA's regulations, enforces actions when warranted, works with program leaders to establish alternative solutions for addressing low-risk compliance issues, refers serious cases to USDA's Office of General Counsel (higher penalties and more serious sanctions against alleged violators)

There are many possible streams for the reporting of animal diseases, including information based on state requirements for reporting, public health requirements, Federal Bureau of Investigation/Department of Human Services notification, internal USDA reporting, public USDA reporting, national reporting and international reporting (OIE, Trading Partner communication).

Animal diseases can be reported to:

- National Animal Health Surveillance System: Integrates animal health monitoring and surveillance activities conducted by many Federal and State government agencies into a comprehensive and coordinated system
- National Animal Health Reporting System: SAHOs report monthly on the occurrence of confirmed OIE-reportable diseases
- National List of Reportable Animal Diseases: While still in progress of being developed, it's a single, uniform, standardized list of reportable diseases for which there would be consistent reporting criteria across the states in order to facilitate national and international commerce, assist in meeting OIE and other reporting requirements, is based on the OIE list of reportable diseases, with minor variations from the list of diseases currently being reported through the National Animal Health Reporting System

The mission of OIE is to support safe international trade of animals/products. OIE provides information on the occurrence and distribution of animal diseases throughout the world, and defines animal health related standards all for governmental use in making risk-based regulatory decisions. With more than 180 member countries, OIE uses a democratic process. Further, USDA VS expends considerable resources meeting the reporting requirements and providing input into the OIE standards. In the event

of a trade dispute, the World Trade Organization (WTO) refers to these standards in formulating a resolution.

USDA's Equine Health Team provides specific planning and support by providing options for control of EIA; assisting the industry with the development of a National Equine Health Plan; providing subject matter expertise and partial funding to the Equine Disease Communication Center (EDCC); participating in a high-level annual APHIS stakeholder meeting; and annually revising the Equine Health 5-Year Activity and Strategy Plan to provide transparency and clarity, and increase awareness of stakeholders through timely posting of updates on the USDA VS website. The APHIS/Bureau of Land Management (BLM) Wild Horse and Burro Partnership is an interdepartmental agreement that provides the BLM with veterinarians and experts in animal health and welfare that provide consultation/support. APHIS veterinarians provide a second opinion and epidemiologic support for BLM facilities, and consultation on animal health and welfare issues.

NATIONAL IMPORT EXPORT SERVICES OVERVIEW

The structure of USDA VS starts with the Office of the Deputy Administrator (ODA); under ODA are Surveillance, Preparedness and Response Services; National Import Export Services (NIES); Science, Technology and Analysis Services; and Program Support Services.

The role of NIES is to facilitate international trade of animals, animal products and biologics; protect the health of U.S. livestock and poultry; and find the right balance between these two items. State, industry and academia support is essential.

NIES is the international face of APHIS VS:

- International Animal Health Standards Services within NIES coordinates OIE activities
- OIE is recognized by WTO as the standard-setting body for animal health
- OIE develops and establishes health standards for safe trade of animals and animal products, and makes recommendations for the overall well-being of animals
- Scope extends beyond disease to welfare, standards for veterinary education and food safety

The criteria for OIE listing of diseases is international spread, emerging potential, zoonotic potential and significant spread in naïve populations.[12] OIE-listed equine diseases include African Horse Sickness, CEM, Dourine *(Trypanosoma equiperdum),* Glanders, Venezuelan Equine Encephalomyelitis, EP, EIA, EHV-1, EVA, Equine Encephalomyelitis-Eastern (EEE), Equine Encephalomyelitis-Western (EEW) and Equine Influenza.

OIE-listed diseases of multiple species, some of which affect equids, are Anthrax, Aujeszky's Disease, Bluetongue, Brucellosis, Echinococcosis/Hydatidosis, Foot and Mouth Disease, Heartwater, Japanese Encephalitis, New World Screwworm, Old World Screwworm, Paratuberculosis, Rabies, Rift Valley Fever, Rinderpest, Surra, Trichinellosis, Tularemia and West Nile Fever.

Risk-reducing measures include import-risk analysis involving risk assessment, management and communication; evaluation of VS in exporting countries; regionalization/zoning/compartmentalization of exporting countries for certain diseases; surveillance, diagnosis and prompt reporting of equine disease outbreaks to appropriate regulatory agencies and industry organizations; and pre-export and post-import isolation and testing for equids for specific diseases.

Import regulations protect the U.S. livestock population against the introduction of disease. There are quarantine facilities in Los Angeles, Calif.; Miami, Fla.; and New York, N.Y. There are permanent, privately owned facilities in Los Angeles; Puerto Rico; Chicago, Ill.; and Miami. These facilities provide

Foreign Animal Disease Diagnosis and quarantine. Mexico has land border quarantine stations; no quarantine is required for Canada.

For special events, temporary import quarantines are established. APHIS sets standards for the facility and operations, oversees quarantine functions and provides export certification of departing horses at the conclusion of the competition. Planning and coordination for special events involves event organizers, SAHOs, brokers and shipping agents, Customs and Border Protection, and airport authority. It must be established where the horses will arrive, where they will be stabled, where they are coming from and when they will leave.

Export requirements are standards set by the country to which the horse(s) will be exported. They are negotiated by APHIS, must meet requirements of the foreign country, and be scientifically sound and reasonable. While diseases of concern vary by county, several are of concern to many countries, including VSV, EVA, WNV, EEE, EEW and CEM. APHIS negotiates standards and facilitates trade.

Things that could go wrong during the exportation process includes horses not getting cleared for export due to documentation or a change in U.S. disease status, reset of pre-export isolation timeline, complete or partial quarantine, or refused entry by the importing country.

ROLE OF SAHOS IN PROTECTING EQUINE HEALTH

SAHOs, under the direction of the State veterinarian, protect animal agriculture in their respective states through disease surveillance and implementation of movement regulations and control activities for regulated diseases. The SAHOs in each state are the experts in livestock health regulations and are responsible for development and enforcement of state animal health laws. State animal health laws are typically based on Federal regulations outlining Federal disease control programs; however, state-specific laws may go beyond those included in Federal disease control programs to address industry designated livestock disease risks of concern within a state.

Historically, SAHOs primarily focused on protecting the health of food producing animals, such as cattle, sheep, swine, goats and poultry to ensure a wholesome, healthy, food supply for U.S. consumers. The available funding and workforce efforts are focused on diseases or situations which pose public health or catastrophic animal health risks. Due to this prioritization of funding and personnel, limited resources and expertise may be available to address equine health issues in a state. Additionally, over the past ten (10) years, reduction in State and Federal budgets and personnel have significantly impacted the availability of resources in many states.

At a minimum, SAHOs monitor equine diseases and equine movement in states to mitigate threats and to effectively respond to disease incursions. Equine regulatory disease responses include identifying diseased equids, those with positive test results for diseases regulated in the state, conducting epidemiologic investigations, tracing and potentially testing exposed animals, assessing and determining quarantine implementation and release parameters, implementing appropriate disease control methodologies, issuing movement restrictions when appropriate, and reporting disease investigation findings. Implementation of science-based biosecurity measures is critical to protecting the health of the national equine population from diseases of regulatory concern.

Equine diseases of regulatory concern are those which have potential state, national or global significance. For example, an incursion of a Foreign Animal Disease, such as African Horse Sickness (AHS) in the U.S., would have a significant national and global impact as the U.S. equine population is naïve to this disease and could result in high mortality and immediate trade implications, including likely

movement restrictions on export of equids from the U.S. In contrast, an introduction of *Streptococcus equi subspecies equi* into a group of horses on a U.S. farm would result in limited fatalities in the affected horses and minimal, if any, restrictions on trade. Both diseases are of concern to the U.S. equine industry; all states require reporting of AHS if it were to occur in the U.S. However only a few states require reporting of strangles cases.

The World Organisation for Animal Health (Office of Epizootics International – OIE) member countries must report the occurrence of any disease deemed by OIE as of international significance. Detection of a foreign animal disease, one not known to exist in the U.S., would have major economic and trade impacts and require immediate State/Federal notification and prompt implementation of control measures to protect the U.S. equine population.

It is important to note that SAHOs are responsible for monitoring equine disease trends in their states to assess risks and to determine triggers for enhanced disease control measures in the state. Each state develops and maintains a reportable disease list, which may include endemic equine diseases of concern to the state's equine industry, in addition to OIE and USDA reportable diseases and conditions. SAHOs determine what diseases are reportable to their office, often in consultation with industry. Industry-driven reportable diseases may include diseases such as strangles or pigeon fever. The state veterinarian determines who is responsible for reporting the disease or condition (i.e., diagnostic laboratory, veterinarians, owners, etc.), who to make the report to (State/Federal official), when it should be reported (i.e., immediately, within 24 hours, within 2 days or within 30 days), and what should be reported (suspicious signs or conditions, laboratory confirmed case, confirmed disease agent detection).[13]

Categorizing a disease as reportable to the SAHO doesn't necessarily mean the SAHO will take action based on the report. It is important to understand that there is a difference between disease monitoring vs. diseases where there will be regulatory action taken.[13] The industry's role is to report detected diseases and assist in the development of state and national reportable disease lists. In response to reportable diseases, SAHO's have the option to take no action, isolate or quarantine the animal, implement movement restrictions, test animals, treat animals or require humane euthanasia. Inconsistencies in state reportable animal disease lists are a recognized challenge to those in the equine industry. The lists generally represent a variation in equine disease risk and control issues across the states.

At the national level, several organizations work on equine regulatory issues, such as the USAHA, NIAA and the American Horse Council (AHC). Additionally, national breed or discipline organizations play a role in protecting equine health by addressing regulatory issues.

The USAHA mission is implemented through deliberations of its' 32 science-based committees and the adoption of resolutions and recommendations aimed at solving animal health problems. The purpose of the USAHA Committee on Infectious Diseases of Horses (IDOHC) is to address and seek solutions to infectious disease issues that can compromise the health of the nation's equine population. As part of its purpose, the Committee resolves to keep USAHA members, USDA, the equine industry and other stakeholders informed of disease problems confronting the industry. The committee also serves as a sounding board for discussion on equine health-related issues and for the development of strategies/solutions to resolve such problems. The IDOHC has four disease subcommittees that include a subcommittee on Equine Infectious Anemia, Equine Piroplasmosis, Equine Herpesvirus-1 and Contagious Equine Metritis. Subcommittee work focuses on utilizing scientific and diagnostic advances to implement new policies and procedures for regulatory disease control. Participation in IDOHC and

subcommittee activities is restricted to members of USAHA. The American Association of Equine Practitioners (AAEP) recently became an association member of USAHA.

The mission of NIAA is to provide a resource for individuals and organizations to obtain information, education and solutions for challenges facing the animal agriculture industry. NIAA is dedicated to programs that promote best practices in the management of animal health and well-being. The mission of the Equine Committee is to address key equine health issues relevant to the economic well-being of the U.S. equine industry. To view proceedings of previous NIAA Equine Committee meetings and accomplishments, see *http://www.animalagriculture.org.* Those interested in discussing equine issues are encouraged to become a member of the NIAA Equine Committee.

SAHO's role in outreach and education includes disease outbreak reporting, creation and distribution of state-specific outreach materials, maintenance of websites/social media outlets and providing presentations to livestock industry groups and practitioners.

Over the years SAHOs have experienced many challenges in equine disease control. The concerns identified include the limited ability to control disease (untested populations, illegal horse movements, lack of funding for testing and tracing, and lack of traceability allowing disease spread), and the inability to provide adequate outreach to the equine industry (segmented industry makes it difficult to reach every horse owner, and the speed of social media vs. the speed of governmental agency outreach mechanism).

Specific challenges of SAHOs include an increased number of equine disease outbreaks, limited equine expertise on staff in some states, limited funding for equine programs, limited Federal authority for action on certain equine regulatory diseases of concern, limited traceability of equines and communication with all aspects of the diverse equine industry.

Everyone involved with the equine industry has a role in protecting the nation's equine population and addressing equine regulatory issues. Personnel working daily with horses play a vital role in identifying and reporting the occurrence of regulatory diseases, which threaten the U.S. equine industry in order to ensure prompt response and immediate control. SAHOs rely on the industry to be the eyes and ears in the field for detection of a potential reportable disease. Communication and cooperation between the equine owning public, private practitioners, industry organizations and State/Federal animal health officials are pivotal for advancing and protecting the health of the nation's equines.

SAHOs encourage equine stakeholder participation in regulatory issues by providing the expertise, experience and industry perspective at the local level; assisting in dissemination of information; promoting and practicing biosecurity; educating fellow industry members on equine health issues, supporting Federal regulations for consistent management of equine diseases, and implementing industry disease prevention measures.

ROLE OF PRIVATE PRACTITIONERS IN PROTECTING EQUINE HEALTH

A private practitioner's role in protecting equine health has many components. The majority of the time, private practitioners will be the first health professional to encounter the "diseased" horse. The practitioner must be prepared to differentiate whether the disease is infectious, contagious and communicable or non-infectious. Infectious diseases are clinically evident diseases that result from the presence of pathological microbial agents, including viruses, bacteria, fungi, protozoa, multicellular organisms (internal and external parasites) and prions. Contagious or communicable diseases are those that spread from one animal to another by direct or indirect contact. Non-infectious diseases are non-

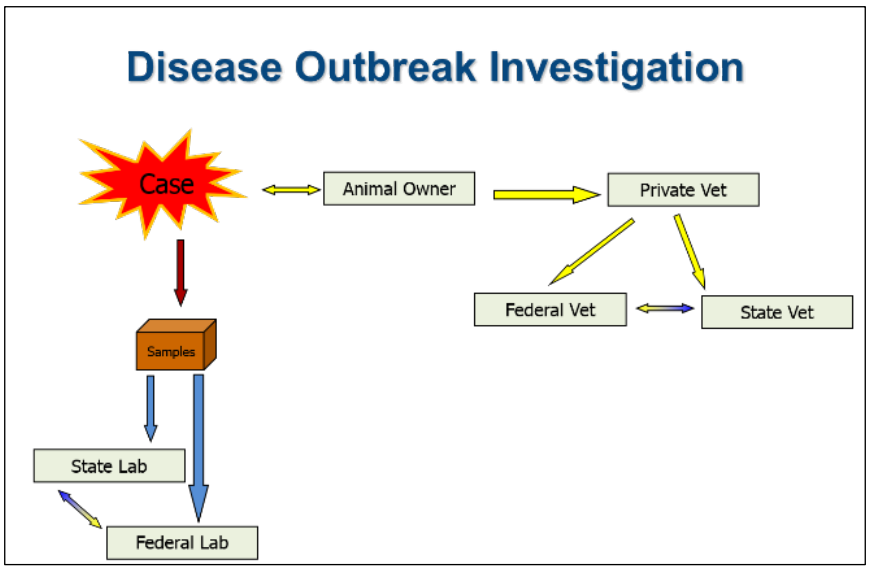
transmissible and result from degenerative, auto-immune, metabolic, neoplastic, nutritional, genetic and other processes.[14]

A hypothetical case illustrates the practitioner's role. He/she is summoned to evaluate a horse with the clinical signs of a "sick" horse, including a temperature of 104° F, increased respiratory rate, cough, nasal discharge, depression and decreased appetite. The clinical symptoms indicate the etiology to be an infectious disease. History of the horse is of paramount importance, including the duration of clinical signs, contact with other horses, travel and immunizations.

A rapid diagnosis is essential in such a case. A rapid diagnosis includes selection of tests that provide a rapid turnaround, and are sensitive and specific such as Polymerase Chain Reaction (PCR) tests. Nasal swab PCRs can be submitted in order to detect *Streptococcus equi equi*, EHV-1, EHV-4, Influenza A and Equine Rhinitis Virus A and B. Multiple other rapid diagnostic tests are available for other diseases. Therapy, isolation and biosecurity measures should be initiated immediately. If neurological signs are evident, SAHOs should be contacted immediately.

A major role of private practitioners is to practice preventative medicine, which includes providing vaccinations to immunize their patients against infection with EEE, EEW, Tetanus, WNV, Rabies, Influenza/Rhino, Anthrax, Botulism, Equine Rhinitis Virus A, EVA, Leptospirosis, Potomac Horse Fever, Rotavirus and Strangles. In some instances the use of autogenous vaccines may be indicated. Private practitioners also safeguard human health; zoonotic disease examples include EEE, EEW, Rabies, Salmonellosis, VS and WNV. The private practitioner is also a major driver in the acceptance of biosecurity practices; strategies to reduce risk of disease outbreaks include planning ahead, naming who is in charge, taking into consideration language issues when communicating with clients and farm personnel, the need to control horse movement, the need for barrier precautions, use of disinfection, monitoring for disease and use of vaccination.

An example of how important immunizations are in the protection of equine health is an Equine Influenza outbreak in Australia in 2007. It was started by Japanese racing stallions in a quarantine facility and lead to a 7-month outbreak that caused 10,000 premises to be quarantined in two states.



Private practitioners work as a liaison with State and Federal animal health officials as a critical component of safeguarding animal health. The mission of the National Accreditation Program is to provide the accredited veterinarian with the information they need to ensure the health of the nation's livestock and animal population, and to protect public health and wellbeing. It is important private practitioners have knowledge of Foreign Animal Diseases and other reportable diseases, know the value of CVIs, track interstate and international movement, and promote the adoption of a uniform identification system (microchip).

Also as a liaison, the private practitioner acts as a communicator between the equine industry and regulators (State and Federal animal health policies); cooperates with the colleges of veterinary medicine; drives research that may lead to enhanced field diagnostics, improved treatments and advance control strategies; and participate in clinical trials that can lead to enhanced equine health. They communicate disease information by direct contact with clients, newsletters, weekly meetings of professional staff, American Association of Equine Practitioners Touch Program, and with information from the EDCC to assure the movement of horses remains unobstructed if an outbreak occurs, in order to access biosecurity toolkits, and be aware of accurate and timely updates that are being released.

OVERVIEW OF INFECTIOUS DISEASES OF INDUSTRY IMPORTANCE

Infectious doesn't necessarily mean contagious. There are risks of outbreaks at farms/stables/hospitals where there is a large concentration of horses, where there is a lot of traffic on and off the premises, and where the vaccination protocols vary. Traditionally, little emphasis has been put on infection control on horse farms/stables.

Basic principles of diseases of industry importance include understanding the biology of infectious diseases; housing based on risk of exposure; daily monitoring for signs of infectious disease; hand hygiene; cleanliness, decontamination and disinfection; preparing for rapid action (contingency plan); and immunization.

Housing based on risk of exposure includes farm-based protocols in order to minimize risk of disease spread (house in small groups; group by age, use and gestational time), barn and event-based protocols (individual stalls, no contact with other horses; daily monitoring; reducing unnecessary movement; minimizing use of shared equipment between horses), and hospital-based protection protocols (screening all patients before admission, grouping animals based on infectious disease status, maintaining hygiene and cleanliness, and daily patient monitoring).

Monitoring of health status includes daily physical evaluations (attitude, appetite, rectal temperature, presence of nasal discharge, coughing, changes in fecal character and acute onset of neurological signs) and keeping good medical records.

Hand hygiene is an important step to prevent disease spread; it is easy to do/use and is cost effective. Wash before and after attending to each horse with soap and water for 45 seconds or, when water is not, available utilize hand sanitizers.

Cleanliness applies to housing areas including stalls, high traffic areas and stocks, and includes removing all organic material; rinsing doors, stall walls and floors; scrubbing with detergent; rinsing doors, stall walls and floors again; and then applying a disinfectant. It also applies to equipment, including grooming supplies, wipe rags, buckets and tack. All of these items need to be rinsed, washed and disinfected, and then allowed to dry.

Preparation for rapid action includes having a predetermined plan in place that includes:

- Establishing a sick horse trigger point
- Isolating the sick animal
- Wearing protective clothing
- Instituting barrier nursing precautions
- Contacting a care provider
- Securing diagnostic samples
- Monitoring horses in close contact

Immunization programs are the most successful application of immunological principles. Vaccination decreases the severity of disease and shedding of pathogens. More intensive vaccination schedules are needed for high-risk horses. There are new vaccines being produced that can be added to vaccination protocols.

Respiratory pathogens, especially upper respiratory tract infections, are common. They spread via fomites, droplet and/or aerosols; cause high morbidity, but low mortality; the severity of signs depends on the horse, environment and pathogen factors. Some disease agents can cause latent infections and result in subclinical shedding. Equine respiratory pathogens are detected in 26 percent of investigated infectious upper respiratory disease cases. EVH-4 and Equine Influenza Virus (EIV) are the most common viruses detected in horses with infectious upper respiratory disease. There is a high susceptibility of young performance horses to respiratory pathogens. Recently PCR-positive EIV cases in the U.S. have occurred in older and previously flu vaccinated horses. There has been an introduction of Clade 2 EIV into U.S. horses via international transportation. The role of less characterized viruses such as EHV-2/-5 is still unclear.[15]

Enteric pathogens cause gastrointestinal infections that are sporadic in adult horses, including *Salmonella* spp., *Clostridium difficile* and Equine Corona Virus (ECoV). Enteric pathogens spread rapidly via fecal oral transmission. Several risk factors have been associated with increased susceptibility to infection with enteric pathogens. Horses with enteric pathogens can be asymptomatic shedders, cause zoonotic risk and expose other horses to emerging pathogens.[16] While there is sparse information and preliminary observations, ECoV can cross species. ECOV has been recognized sporadically and as epizootic in occurrence. There has been a steady increase in cases of ECoV since 2010, with higher case numbers during colder months of the year over a wide geographic area. The predominance of cases are in adult horses. More cases are seen in riding/racing/show horses than in breeding horses. Spread is likely from fecal -oral route (respiratory route is unlikely). Morbidity is variable (10 to 83 percent), while mortality is low; the incubation period is short at 48 to 72 hours.[17]

There is a high seroprevalence to *S. neurona* (one of the causative agents of Equine Protozoal Myeloencephalitis (EPM) with geographic differences (78 percent). There is a wide distribution of *N. hughesi* (34 percent) a second cause of EPM, across the county with no regional differences. There is a breed (more common in Warmblood horses) and age risk factor for EPM. It usually hits horses 1 to 4 years old in the winter. Occurrence of EPM case(s) has been associated with prior EPM case identified on the premises, contact with wildlife (opossum), presence of cats, use of the horse (racing/show more than pleasure/breeding) and health status of the horse. It can be treated with Ponazuril with daily/intermittent administration to reduce the infection; with Nitazoxanide twice weekly at a rate of 25 mg/kg to reduce the attack rate on an premises (12 vs. 0 percent attack rate); or with Diclazuril as a low daily dose (0.5 mg/kg) to lower seroprevalence/titers in treated foals.[18]

Lyme disease is a vector-born disease caused by *Borrelia burgdorferi sensu stricto* and is transmitted by *Ixodes* ticks in North America. The disease is a challenge to diagnose as evidence of exposure to the causative agent does not necessarily correlate with clinical disease. Affected horses can show variable clinical signs such as weight loss, stiffness/lameness, muscle soreness/wasting, low grade fever, poor performance, lethargy and behavioral changes. It can result in ocular disease and neurologic disease (neuroborreliosis). Diagnosis of lyme disease encompasses inclusion of various factors including the geographic areas that include tick exposure, ruling out other diseases, clinical signs and high antibody titers.[19] There are various antibody assays available (ELISA, Immunofluorescent Antibody, Western Blot, Multiplex test) that can be performed. Prevention of lyme disease is through tick control and use of an available commercial canine vaccine.

Pigeon Fever, is caused by infection with a bacteria called Corynebacterium *pseudotuberculosis*, the bacteria is a soil-borne organism. Flies act as a mechanical vector. The disease is spreading to States east of the Mississippi, with various clinical presentations, including external abscess formation, internal infection and ulcerative lymphangitis. Pigeon Fever can be prevented with bacterin/toxid vaccine, good sanitation and fly control, proper disposal of manure to reduce fly populations, proper wound care of horses with draining abscess and preventing ventral midline dermatitis through frequent application of insect repellants.[20]

In summary, there are many challenges to control of endemic equine infectious diseases that include the fact that the infection status of a horse can't be determined solely based on clinical presentation, biology of various pathogens is poorly characterized, there is a lack of metrics to determine impact of various diseases, biosecurity is often too complicated and lacks compliance, there is a lack of ownership of the problems , and it's necessary to maintain centralized resources of information on disease outbreak and provide disease alerts.

INTERNATIONAL THREAT FROM SPREAD OF SELECTED EQUINE DISEASES

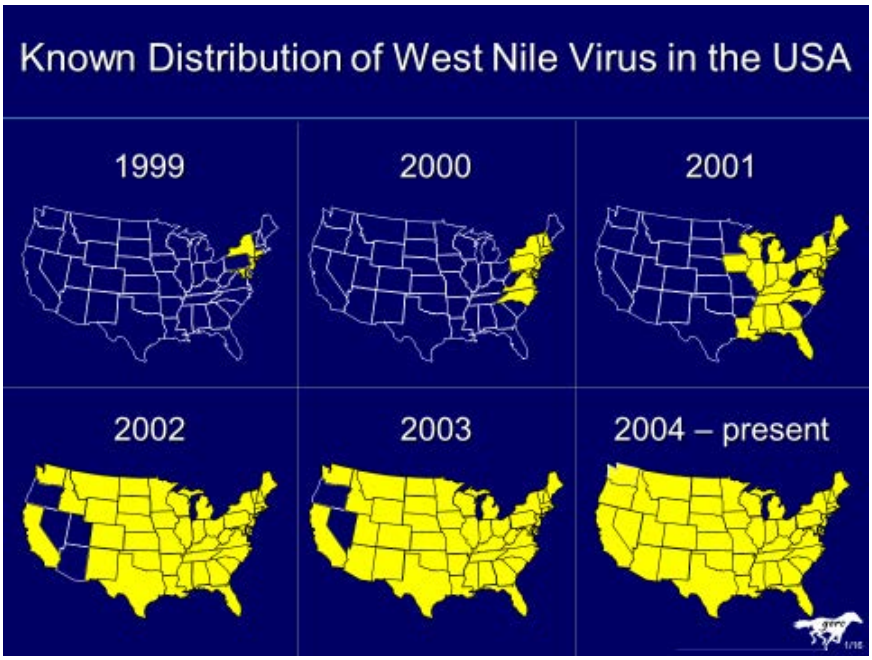
No longer is any country remote from the risk of incursion of various human and animal pathogens; that was exemplified by the discovery of WNV in New York in 1999. Previously, it was never known to occur in the western hemisphere. Fewer and fewer infectious diseases are currently considered restricted in respect of their worldwide distribution. As geographical boundaries disappear around the world, diseases can move with greater ease between countries and even between continents; further, no longer can intact borders be relied upon to prevent the incursion of infectious diseases.

The horse is unique compared to other domestic species because they are the longest lived of the traditional domestic species, their individual economic value can greatly exceed that of any other species and many horses are national/international "jet-setters." The nature of international movement of horses involves the majority being shipped for competition purposes (racing, show-jumping, eventing, driving, endurance riding, etc.), movement of mares and stallions for breeding purposes, relocation due to change of ownership, and shipment for processing.

Significant trends in the horse industry in recent years include proliferation in the number of prestigious racing/equestrian events (between 2004 and 2014 Fédération Equestre Internationale-sanctioned events increased by 255 percent), a considerable increase in the number of stallions used for dual-hemisphere breeding, and acceptance and use of AI by the vast majority of breed registries.

Where equine infectious diseases are concerned, factors affecting worldwide distribution include greater globalization of trade in horses and semen; multinational trade agreements; emergent diseases; mutation of recognized pathogens; climate related phenomena; migration of amplifying/reservoir hosts or vectors of specific pathogens; and availability of "new" vectors, changes in land management, vaccine contamination and agri-terrorism.

International trade is the single most important factor responsible for the dissemination of equine infectious diseases. Certain diseases may be spread by horses approved for temporary, as well as for permanent, importation. Infective animal products (semen, plasma) have been implicated in the spread of specific diseases (EVA and EIA). The greater the volume of horse imports, the greater the risk of disease incursions into the importing country.



Where globally significant equine infectious diseases are concerned, the most important sources of infection are subclinical acutely infected animals, carrier animals, semen/embryo and sub-clinically infected mares. Potential modes of transmission include respiratory, venereal, arthropod, congenital and iatrogenic.

Incursions of foreign animal/transboundary equine disease and whether such incursions are transient or long term is dependent on a range of factors that determine whether a foreign animal or transboundary disease is eradicable or not. Concerted support from the equine industry is critical to ensuring success of any control or eradication program. Certain foreign animal or transboundary diseases may not be eradicable once introduced into a country. Increased globalization of trade in equids and germplasm facilitated by various multinational trade agreements has influenced worldwide distribution of equine infectious diseases.[21] Distribution of many equine diseases is a dynamic one due to the spread of a particular disease through international trade, emergence of "new" diseases or re-emergence of new biotypes of recognized pathogens. Equine diseases currently *not* known to occur in the U.S. include African Horse Sickness, Venezuelan Equine Encephalomyelitis, Glanders, Screwworm, Equine Encephalosis, Dourine, CEM and Epizootic Lymphangitis.

Factors contributing to the international spread of equine diseases include limited awareness of the latest scientific information on the epidemiology, diagnosis and control of specific diseases; lack of reliable laboratory testing capability for certain diseases; lack of or inadequate surveillance and reporting of OIE-listed diseases; lack of uniformity among countries in implementation of the OIE Animal Health Code standards; lack of or inadequate pre-export testing, veterinary inspection and certification.

Risk reducing measures include import-risk analysis involving risk assessment, management and communication; evaluation of veterinary services in the exporting country; regionalization/zoning/ compartmentalization of the exporting country for certain diseases; surveillance, diagnosis and prompt reporting of equine disease outbreaks to appropriate regulatory agencies/industry organizations; pre-expert and post-import isolation and testing of horses for specified diseases.

Actions needed to mitigate the risk of global spread of equine diseases includes greater interaction between national animal health officials and respective equine industries, improved surveillance and reporting of specific equine disease outbreaks, training of laboratory personnel in internationally approved diagnostic procedures, greater international exchange of information on matters of equine health and welfare, and the appointment of a key person in each country to liaise with industry and regulatory authorities on matters of equine health and trade.

OVERVIEW OF RISKS OF INTERNATIONAL EQUINE MOVEMENT

HORSE IMPORTATION – OVERVIEW AND ISSUES

Importing animals into the U.S. requires NIES oversight for animals, semen and embryos, including horses, cattle, swine, birds and certain wildlife/exotics/reptiles. It requires government certification, testing in the country of origin, quarantine and testing in the U.S., and places prohibitions on imports from certain countries. In 2013, 22,849 horses were imported into the U.S. – 14, 325 from Canada, 2,229 from Mexico and 6,245 by air.[22]

Import requirements include an official government-endorsed health certificate from the country of origin; quarantine upon arrival in the U.S. for 3, 7 or 60 days depending on the country of origin (minimum of 42 hours); testing equine while in U. S. quarantine facility for Dourine, Glanders, EP and EIA; and the right to refuse entry. Imports are allowed from any country.

The Code of Federal Regulations Import Requirements §93.308 Quarantine Requirements State that "(a) Except as provided in this section and in §93.324 [horses from Mexico], horses intended for importation into the U. S. from any part of the world shall be shipped directly to a port designated in § §93.303 and 92.324 and be quarantined at said port until negative results to port of entry tests are obtained and the horses are certified by the port veterinarian to be free from clinical evidence of disease. The electronic Code of Federal regulations can be found at *http://www.ecfr.gov;* click on Simple Search on the left, retrieve by CFR Citation, Title 9, Part 93, Subpart C.

Release criteria includes negative results on mandatory tests; written protocol for testing, retesting and holding cohorts; "Free from clinical evidence of disease," including normal temperature taken two times per day and no nasal discharge or swollen lymph nodes, normal appetite and manure; then, no additional testing is required unless medically necessary.

Issues for further evaluation include:

- Most imported horses are quarantined for 42 hours (3 day imports)
- Possibility that the horse is incubating a disease and is clinically normal when released
- Holding horses potentially exposed to non-regulated diseases
- Significant expense to importer when horses are held
- Differences among States in diseases of concern
- The diseases of most concern by the States for horses being released from the import process/centers are strangles and EHV

The future of regulations likely will include an entire overhaul of import regulations to be, less prescriptive, with a move of specifics out of CFR into guidance documents thus allowing for more flexibility and the option to be better able to keep up with scientific advances than with formal rule making process with comment period.

DISEASE RISKS ASSOCIATED WITH INTERNATIONAL MOVEMENT OF EQUINE

International threat from spread of selected diseases:

African Horse Sickness (AHS)

There is a potential threat of introduction of AHS into the U.S. AHS is a highly important OIE-listed equine disease that affects all equidae. Horses and mules are the most susceptible equine species, with case-fatality rates of 70 to 95 percent; donkeys are less susceptible than horses to disease and zebras

are only sub-clinically infected with the virus. AHS is an insect-borne *Orbivirus* disease that is endemic in parts of southern Africa. Nine virus serotypes exist. Dogs can be infected with the virus and infection is often fatal. Naturally and experimentally produced disease has been recorded in dogs.[23] In terms of geographic distribution, AHS is endemic in tropical equatorial regions of sub-Saharan Africa. The disease appears annually in the Republic of South Africa and is seen initially in Northeast Transvaal. In 1959-1963, there was a major epidemic extending from Turkey and Cyprus in the Middle East to Pakistan and India. In 1966, the disease spread into Spain. From 1987-1990 the disease was re-introduced into the Iberian Peninsula. Infection with AHS virus has been reported in camels, Angora goats, African elephants, cattle and sheep. Encephalitis has been recorded in humans working with certain neurotropic strains of the virus. There are four classically recognized forms of AHS; these include the peracute (pulmonary), subacute (cardiac), acute (mixed pulmonary and cardiac) and mild (horse sickness fever). The incubation period can range from 1 to 2 weeks, the duration of the illness is 7 to 10 days, viremia in horses lasts 4 to 8 days, and mortality rates in horses can be as high as 70 to 95 percent.[24] The pulmonary form of AHS ("Dunkop") is a peracute form of the disease, with an incubation period of 3 to 5 days. Fever can go up to 41°C, and can include depression, profuse sweating, severe pulmonary edema, dyspnea, coughing and a copious frothy nasal discharge. The course of the disease can take from 30 minutes to a few hours after the onset of clinical signs. The case fatality is up to 95 percent. The pulmonary form of AHS is most frequently seen in dogs. The cardiac form of AHS ("Dikkop") is a less acute form of the disease in horses. The incubation period extends from 4 to 9 days, with horses developing a fever up to 41° C, depression, supraorbital non-pitting edema, swelling, petechiation and eversion of the conjunctivae, edema of the head (lips, eyelids, cheeks and tongue) and neck. It also includes ventral (thoracic and abdominal) edema, periods of recumbency and sometimes colic. The disease course is 4 to 8 days after the onset of clinical signs and the case fatality rate is approximately 50 percent. The mixed form of AHS is a combination of pulmonary and cardiac forms of the disease, and is usually diagnosed on necropsy examination. The incubation period is usually 3 to 5 days, and the initial evidence of pulmonary involvement is followed by edematous swellings. Signs include acute paroxysms of coughing, copious frothy nasal discharge, collapse and death in 3 to 6 days. Case fatality is up to 70 percent.[25]

AHS fever is the mildest form of the disease, and is typically seen in partially immune horses and in donkeys and zebras. The incubation period usually lasts 5 to 14 days, and is followed with a moderate, recurring fever (3 to 8 days), anorexia, depression and perhaps mild conjunctivitis and dyspnea. Affected animals usually recover rapidly. AHS is a non-contagious infectious disease – it isn't transmitted directly between horses. Midges are the primary vectors, with *C. imicola* as the most important vector; other *Culicoides* spp. (e.g. *C. bolitinos* and *C. variipennis*) are also vectors. Additionally, *C. sonorensis* is widely distributed in the U.S. and has been experimentally proven to be a vector of AHS Type 4 virus. There is an extrinsic incubation period in midges of 8 days. There is no evidence of transovarial transmission or over-wintering of the virus in *Culicoides* larvae. Mosquitoes and various biting flies may play some role in virus transmission. Certain tick species can transmit AHS virus, but aren't considered significant vectors. General features of the epidemiology of AHS are that its only endemic in parts of Africa; major epidemics have been recorded in South Africa every 10 to 15 years; in endemic areas, usually one serotype predominates in a particular season and another serotype the next year; serotypes 3, 4 and 9 are identified with the spread of AHS outside Africa; and there is no evidence of a carrier State in recovered horses, mules, donkeys or zebras.[26]

AHS viremia is detectable about 24 hours before the onset of fever. It is present for up to 8 days in horses and parallels the febrile response. It may persist for up to 4 weeks and somewhat longer in zebras, mules and donkeys. It is a virus that is associated with the red cell elements in blood. There is no evidence of viremia in recovered horses. Pathways for introduction of AHS include movement of equids

(horses, mules, donkeys and zebras), movement of animal products (semen and serum), transport of infected vectors (*Culicoides sp.* – plants, animals, airplanes and ships), active flight of infected vectors (*Culicoides sp.*), and windborne transmission of infected vectors. The establishment of AHS as epidemic or endemic depends on the number and distribution of susceptible hosts, the presence of reservoir hosts, the duration and level of viremia in hosts, vector capacity of local vector population (number of infected bites by *Culicoides* over a 2 to 4 week lifespan) and climate.[27]

Glanders

The resurgence of Glanders is a cause for increasing international concern. Events over the last 10 to 15 years indicate Glanders is no longer as geographically restricted as previously believed. Disease outbreaks in countries from which it had formerly been eradicated heighten the risk of further spread through international horse movements. Practitioners need to be more aware of the risks associated with importing horses from certain countries/regions of the world of questionable Glanders-free status. Glanders is a highly contagious bacterial disease of equids. The causal agent is *Burkholderia mallei* and it was first discovered by Loeffler and Schuetz in 1862. Glanders is widely considered one of the most important zoonotic diseases.[28] *B. mallei* is one of the first agents to be used for biological warfare purposes. Outbreaks are immediately notifiable to OIE as Glanders is an OIE-listed equine disease. The host range for Glanders includes equidae, humans and sometime felidae; if untreated, infections are usually fatal. It has been detected in camels, bears, walruses and dogs. While cattle and swine are resistant, small ruminants can become infected if kept in close contact with affected horses. The disease is endemic in various parts of the world, including, but not exclusive to, Asia, South America and the Middle East. Afghanistan, Bahrain, Brazil, India, Iran, Iraq, Kuwait, Lebanon, Mongolia, Pakistan, People's Republic of China, Syria, Turkey and United Arab Emirates have reported to have had outbreaks of Glanders since 1998. Modes of transmission include direct contact with horses affected with nasal pulmonary forms of the disease, ingestion of food/water contaminated with discharge from respiratory tract/ulcerated skin lesions, indirect contact through sharing contaminated food/water facilities or items of harness, crowding and stress. It is important to know that subclinically infected horses can be carriers and reservoirs and sources of *B. mallei.* Clinical forms of the disease depend on various agent, host and environmental factors; incubation periods can range from a few days to 6 months. Forms of the disease vary according to location of the primary lesions; nasal, pulmonary and cutaneous forms are described. Individual horses may be affected with more than one form of the disease; horses can be acutely/chronically infected with *B.mallei.* Differential diagnosis of Glanders includes Strangles, Meloidosis (*B. pseudomallei*), Ulcerative Lymphangitis (*C. pseudotuberculosis*), Epizootic Lymphangitis (*H. capsulatum var. farciminosum*), Botriomycosis, Sporotrichosis (*S. schenckii*), Horsepox and Tuberculosis. [29] There has been an increased frequency of reported outbreaks in countries in which the disease is endemic, and expansion of Glanders has occurred into countries in which it was previously eradicated. There is proof of spread of the disease through international movement of horses. Disease events in recent years emphasize the need for extra caution if importing horses from certain countries/areas of the world.

Surra

Surra is a non-contagious, infectious disease that was first described in horses and camels in India in the late 1880s. Its known geographic distribution is Africa, Asia, Middle East, and certain countries in Central and South America. It is a source of considerable economic loss in endemic countries or in which the causal agent was recently introduced. It is listed as an OIE multispecies disease. The causal agent of Surra is a hemoprotozoan parasite, *Trypanosoma evansi*. It was the first pathogenic trypanosome to be discovered and taxonomically is related to *T. equiperdum, T. brucei* and *T. congolense*. *T. evansi* is known to infect various domestic and wildlife species, including horses, donkeys, cattle, sheep, goats, pigs,

buffalo, camels, llamas, dogs, cats, elephants, capybaras and coatis. Horses and camels are most severely impacted by the disease. Modes of transmission include natural transmission by blood-sucking insects; *Tabanus* and *Stomoxys* spp. of biting flies are primarily implicated. They serve as mechanical, not biological, vectors of *T. evansi*. There is potential for iatrogenic spread via use of blood-contaminated equipment or by transfusion of infective blood/blood product.[30] Surra is principally seen in tropical/sub-tropical regions of the world. The disease is facilitated by the presence of large populations of biting flies, horses congregated together and the introduction of naïve animals into an endemic area. Capybaras and coatis are believed to be reservoir hosts of *T. evansi*. The incubation period of the disease is 1 to 2 weeks, and subacute, acute and chronic forms of the infection are described. High mortality rates can occur in naïve horses in endemic areas. No vaccine is available against Surra. Prevention and control are very difficult in endemic countries where reservoir hosts are present. Control is dependent on identification and treatment of infected animals, reduction of vector populations, practice of good stable hygiene and possible prophylactic use of certain drugs. Surra is an insidious disease and is readily confused clinically with certain other diseases. It is endemic in some Western Hemisphere countries.[31] There is a need for continued vigilance to monitor for and ensure the exclusion of Surra from the U.S. Hopefully, the U.S. horse population will enjoy continued freedom from this disease.

ROLE OF EQUINE TRACEABILITY IN PROTECTING EQUINE HEALTH

Unique equine identification and practical means for capturing that information electronically is essential for disease traceability and protecting equine health. Efficient systems for tracing equine movement rapidly aid in responses to emergency management situations, business continuity in the face of an outbreak, or in the event of theft. Current methods of identification include lip tattoo, branding (hot iron and freeze), microchip, pictures or physical description. Lack of any permanent identification for most horses in the U.S. along with other challenges such as re-branding (changing existing brands), illegible lip tattoos, lack of wide use of electronic readers for microchip confirmation, and absence of a central repository for microchip data impede progress in equine disease traceability. Most commonly a horse is identified by a general description only on paper CVIs and lacks the specificity to positively identify a horse if needed. Currently the overwhelming majority of equids in the U.S. are not permanently identified and therefore pictures or a written description, sometimes accompanied by registration papers and/or brand inspection papers, are the only means for identifying a horse on official documents.

Typical requirements for interstate movement of equids is a CVI issued within the last 30 days and a negative EIA test. While a 12-month negative EIA test is most common, variations from State-to-State do occur. Other requirements may be put in place if the origin or destination state is experiencing an equine-related disease outbreak. While use of electronic CVIs is increasing, the majority of CVIs are still issued on paper, which when combined with the lack of unique identification, decreases the timely and accurate traceability for equine movement.

In addition to the aforementioned, traceability challenges also include a lack of documentation in general, illegible documentation, limited electronic documentation, and minimal to no enforcement of requirements for documentation at equine events or State border crossings. Improving electronic records through the use of value-added applications for owners, increasing the use of permanent identification, and creating a searchable repository of permanent identification are all means to improve traceability for equines in the U.S.

Many attendees mentioned that a health certificate provides little direct value to individual horse owners and that value must be added in order for compliance to increase. This might be a mobile application that allows a horse owner to view all their health records in one location, for example easily retrieving health certificates, EIA test records, rabies vaccination certificates, etc. on mobile devices for convenience.

EVOLUTION OF EQUINE BIOSECURITY

A Salmonella outbreak that started in July 1996 at the Colorado State University (CSU) Veterinary Teaching Hospital lead to closure of the hospital for cleaning and disinfection. The mitigation of this outbreak lead to many lessons learned and implementation of multiple biosecurity protocols. This event lead to the development of a hospital-wide biosecurity program; the hiring of a director of biosecurity; active surveillance for *Salmonella* ssp. was implemented and nosocomial infections were investigated; and a standard operating procedure was developed for biosecurity that is regularly updated based on surveillance, research findings and lessons learned.

Biosecurity research projects at CSU that were prompted by the 1996 Salmonella outbreak include the evaluation of foot dip vs. footbath and efficacy of various disinfectants for footwear, evaluation of hand hygiene procedures, risk factors associated with *Salmonella* ssp. shedding among hospitalized patients, environmental monitoring for *Salmonella* ssp., and evaluating various disinfection methods for hospital surfaces.

The evolution of veterinary hospital biosecurity lead to the idea that a hospital needs to have a biosecurity program and that it is a critical component of patient care. Most university veterinary hospitals and some private equine practices now have a biosecurity program in place; while these plans won't prevent all hospital-acquired infections, surveillance and action plan can reduce the risk and scope of outbreaks.

Disease outbreaks have created a "need to know." The multi-State 2011 outbreak of EHM associated with horses that attended the National Cutting Horse Association (NCHA) event in Ogden, Utah, was a game changer; it lead to the creation of a task force by the American Association of Equine Practitioners, which developed the plan for the Equine Disease Communication Center.

In the past 10 years, a myriad of resources on equine biosecurity have become available that are directed at different stakeholders (owners, event organizers/facilities and veterinarians) and are available in multiple formats (media, interactive webpage, and educational seminars and webinars). Resources for owners includes an USDA APHIS VS info sheet about biosecurity tips and an online biosecurity risk calculator on the Equine Guelph website.

Information for equine event organizers and facilities includes a biosecurity toolkit available from the California Department of Food and Agriculture and a Business Continuity Plan for equine events through the Colorado Department of Agriculture designed as a walk-through discussion piece. As the event organizer walks through their facility with their veterinarian, they analyze the critical parts of event management to determine practices that could be implemented to reduce the risk of disease introduction at events and discuss strategies, responses and control of the spread of disease at an event, should a disease incident occur.[32] The Business Continuity Plan has been shared by Dr. Carl Heckendorf of CDA with several equine events including the National Western Stock Show, Colorado State Fair, National Little Britches Rodeo Association, Colorado State Junior Rodeo Association, Colorado High School Rodeo Association and Colorado Horse Park.

Infection control plans are also being shared through on-line video interviews with trainers, as part of veterinary student's education and through the American Association of Equine Practitioners Infection control guidelines; there is even an entire chapter in the text book *Equine Infectious Diseases* about biosecurity. Biosecurity has also been a topic featured at veterinary conferences, including State veterinary conferences, the International Equine Infectious Disease Conference and will be part of the American Association of Equine Practitioners In-Depth 2016 Session on Infectious Diseases.

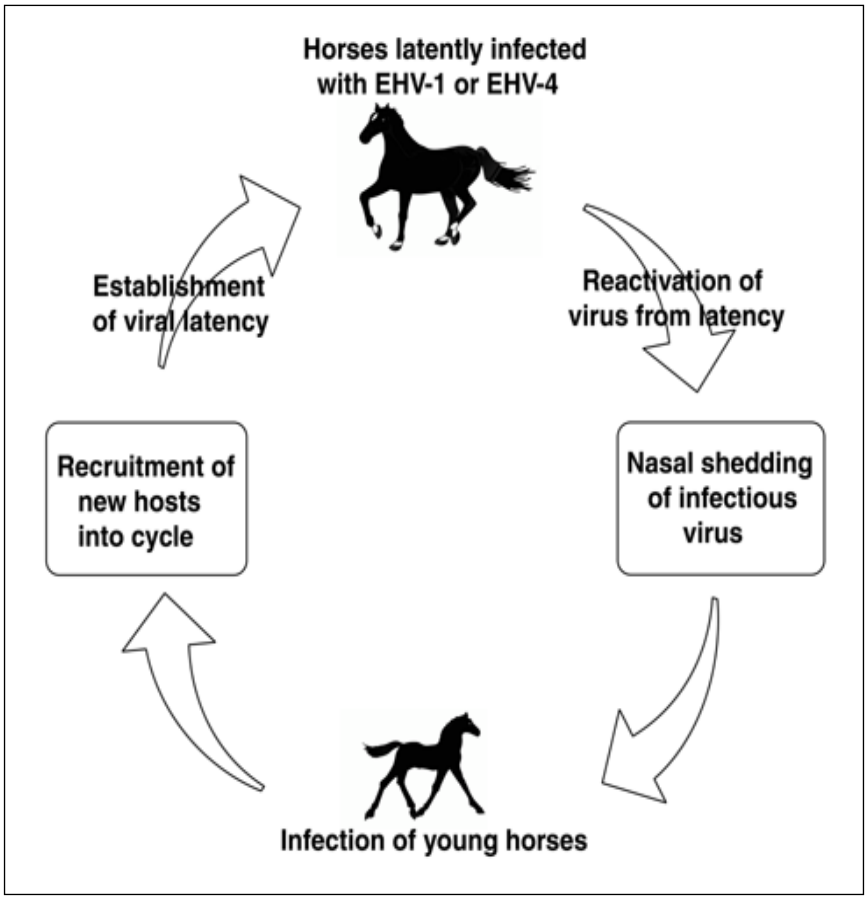
In 2005, the USDA's National Animal Health Monitoring System (NAHMS) conducted a survey regarding equine health management strategies at equine events in six States (CA, CO, FL, KY, NY, and TX). The inferences from the survey covered the population of equine events in the six target States. Survey results are available on the NAHMS website: http://www.aphis.usda.gov/nahmsResults are broken out by scope of the event, e.g. national, regional, and State; type of event show/trial, western event/rodeo/fair, race/polo and other; and by State. Here are a few highlights from the survey: Overall, 32.7% of national equids events required a health certificate for all equines attending the event; 16.8% of national events required any vaccination of attending equids; 29.1% of national equine events provided an on-site veterinarian to monitor equids for illness

In 2009, eight equine breed associations/organizations with the highest equine registration numbers and two organizations that manage several national equine events were interviewed by phone in order to collect questionnaire data related to infection control practices at the events hosted by these organizations. All phone interviews were conducted by a veterinarian with epidemiology training on behalf of the Colorado State University's Animal Population Health Institute. Although the scale for this study (eight national event respondents) was much smaller than the USDA's Equine 2005 study, the information collected showed an increase in some infectious disease control procedures used at events since 2005. In comparison to the USDA's Equine 2005 study which reported that 32.7% of all national events required a CVI for all attending equids and a Coggins test (for equine infectious anemia) for 80% of all attending equids. The 2009 study found that a higher percentage of events (75 and 100% respectfully) had these requirements. The 2009 study asked about the presence of a veterinarian that "specifically monitored for contagious disease occurrences" and found that 50% did provide a veterinarian for this purpose; in comparison, Equine 2005 found that 29% of national events had a veterinarian on-site to specifically "monitor attending horses for signs of illness."

HISTORICAL LESSONS LEARNED AND THE FUTURE OF EHM

April 29-May 8, 2011, the NCHA Western National Championships were held in Ogden, Utah, with 421 US horses included as having primary exposure in the final situation report and a significant number of ancillary horses also were present. Some horses left Ogden on or before May 8. A horse from Colorado that participated at Ogden displayed significant signs of EHM and was euthanized May 11. Following the event, horses dispersed to at least 21 States and provinces. Another horse that had competed in Ogden was euthanized at a cutting event in central California after showing neurological signs of EHV-1 on May 13. The central California show was immediately canceled, with several hundred horses potentially exposed. The Pacific Coast Cutting Horse Association canceled major shows the following week (May 19-22). An industry request for USDA APHIS assistance in developing a situation report using standardized reporting criteria was made to Dr. John Clifford on May 16, 2011. All NCHA-approved shows were canceled May 14-June 6.

Biosecurity measures were strongly recommended as shows reopened. The outbreak proved to be one with unprecedented scope in the U.S., with a majority of the neurological disease associated with primary exposure of horses that were at Ogden. However, secondary cases were reported, new premises were affected approximately 6 weeks after the initial outbreak, and a total of 242 premises had exposed horses –55 confirmed EHV-1 cases and 33 EHM cases confirmed..



EHM is the neurological form of EHV-1 infection. EHV-1 viremia is an intracellular viremia in leukocytes. Virus replication occurs in endothelial cells and causes cell-to-cell spread. Common clinical signs include incoordination and stiffness (spasticity); weakness, often hind limbs are more affected than fore limbs; complete recumbency; and dysuria (spastic bladder). More rare signs include cranial nerve involvement.[33] Treatment of the febrile horse includes supportive care and observation (isolation, stall rest, tender-loving-care, and attention to assuring horse has regular urination and defecation), anti-inflammatories (Non-Steroidal Anti-Inflammatory Drugs or NSAIDs, not corticosteroids), antivirals (valcyclovir-acyclovir and ganciclovir) and restorative (Vitamins E and B). Treatment of the neurological horse includes supportive care (isolation, stall rest, support sling, urinary bladder catheterization, and fluid support), anti-inflammatory (NSAIDS), anti-viral (ganciclovir may have advantage over valcyclovir), and restorative (Vitamins E and B).

EHM is more likely to occur in winter and spring and in large breed horses and is a severe disease in older horses and/or females. It is less likely to occur July-September in horses less than three years old and/or in pony breeds.

Is the increase in neurologic cases due to a “mutant” virus? That is a common question. However, this is not a new mutation in the EHV-1 virus. Over eleven years ago researchers found a one molecule DNA difference between most EHV-1 viruses isolated from abortion cases and neurological cases. The two strains are labeled N752 and D752 or more commonly referred to as wild type or non-neuropathogenic and the neuropathogenic strain. Further studies have shown archived isolates from the 1970’s also demonstrate the presence of the both strain types.[34]

Lessons learned include mitigation of outbreaks similar to the 2011 multi-State incident require significant collaboration by attending veterinarians, referral medical centers, SAHOs and laboratories, and USDA APHIS VS. The 2011 multi-State incident created an increased awareness of the potential

impact of future EHM outbreaks. Further, biosecurity plans must be in place for events and facilities, and attending veterinarians must be trained and take leadership roles in the development and implementation of the biosecurity plans for event centers and events.

The USAHA EHV-1 subcommittee developed guidelines for EHV-1 incident management. This is a comprehensive document meant to aid the SAHO's in responding to EHV-1 incidents. The guideline includes sections on diagnostic testing, quarantine placement, quarantine release, investigation, biosecurity recommendations, communication and vaccination. Early and effective communication with the public is paramount to effectively manage the outbreak through disease control (quarantine of exposed animals at events and at home), prevention of economic loss (unnecessary testing and treatment plans) and prevention of panic (unnecessary show cancellations and movement restriction of horses).

The Equine Disease Communication Center (EDCC) is a communication system which informs and educates all constituents in the horse industry about disease outbreaks in order to minimize their effect on horse health and economy. It provides the most accurate and up-to-date information about current disease outbreaks, uses an alert system to keep all constituents of the horse industry aware of the status of disease outbreaks and risk of disease spread, is the source of information about equine infectious diseases, and provides biosecurity information for horse owners and event managers. In response to outbreaks, the EDCC notifies SAHO and USDA of incoming information about possible disease outbreaks or SAHO or USDA notifies the EDCC about the status of a current outbreak, then SAHO or USDA provides a Statement to post on the EDCC website, sends emails to horse organizations, has subject matter experts available for consultation and response to media inquiries, and alerts status and biosecurity/treatment/vaccination recommendations available on the EDCC website.

The EDCC is helpful and necessary to facilitate and deliver accurate and real time information for all parts of the industry. The EDCC provides an outline of information triage and key decision making steps. The call center at the United States Equestrian Federation has been pilot tested with successful transfer of information. Currently press releases from State veterinarians are being posted to the EDCC website. The EDCC was officially launched in early 2016, is still in the fund raising process, is in the process of hiring a communication specialist and continues to need all of the industry to participate.

A comprehensive National Equine Health Plan is the next logical step now that the EDCC has been launched. The goal would be to provide recommendations to the industry, Federal and State authorities, and tribes on a coordinated approach to disease outbreaks. Objectives will only be achieved through collaborative efforts of the industry, State and Federal partnerships. An advisory taskforce needs to be formed to monitor the EDCC and continue development of the National Equine Health Plan.

Another serious EHM outbreak happened in Doylestown, Penn., where confirmed cases are already quarantined; 4 horses have been euthanized, 6 have neurological impairment, 3 had fevers but not neurological impairment, and 38 are not showing signs yet. In total, there are 51 exposed or affected horses on one premises with 10 neurological cases.[35]

Disease recognition, containment and prevention are vital to the economic health of the equine industry. Informed horse owners and veterinarians can work together to help prevent and mitigate equine disease outbreaks. The EDCC will become a reliable source of information about disease outbreaks. Completion of a comprehensive National Equine Health Plan will help safeguard the U.S. horse population from endemic, emerging and Foreign Animal Diseases, thus protecting the economic viability of the equine industry.

DISCUSSION SESSIONS SUMMARIES

REGULATORY DISEASES

The group discussions focused on three regulatory diseases, specifically, Equine Infectious Anemia, Equine Piroplasmosis and Equine Herpesvirus-1. Below are the issues raised during those discussions:

Equine Infectious Anemia (EIA)

- Federal funding and authority is limited for equine regulatory issues.
- There is a lack overall EIA awareness within the industry. The term "Coggins" is commonly known in the industry, but many horse owners don't really know what it is or any details about the disease. Getting Coggins papers is considered just a cost of owning a horse.
- The current lack of uniformity in testing between States is confusing and challenging for owners and veterinarians. Additionally, the lack of resources for enforcement and compliance limit the success of any program. Uniformity of testing requirements is a bigger issue and need rather than eradication.
- Enhancements to the program could include an accreditation free status, tiered system (zone system) similar to pseudorabies; which would require interstate agreements for movement. However, there is already confusion on State regulations so zoning could be worse. Additionally, without complete horse census data, accurately assigning zone status would be difficult. Also there is the recognized challenge of how the presence of wild/other horse populations would impact status assignment.
- There isn't a unified desire within the horse industry to affect greater control or pursue eradication. Currently, the grassroots level may not buy into the risks (perceived or real). Incentives remain small to push for eradication. Without industry buy in, eradication will be difficult. For eradication to work in the real world, there must be uniformity in regulations and the border must be sealed. Additionally, without teeth in requirement for Coggins papers, it makes finding the last cases very difficult and eradication impossible. Most importantly, Federal and State funding is not available for eradication thus industry would have to fund it.
- Testing is a low priority for most horse owners and many are unlikely to pay for regular testing due to the cost. Current costs is estimated at $150 per test as it requires the expertise of a veterinarian and examination of the horse. The $11 million figure for testing may be low on the actual costs.
- With limited Federal funding, EIA control program should focus on identification of high risk horses. Testing should be targeted to high risk populations and change of ownership testing.
- USDA is soliciting ideas on how to test untested populations. Potential to offer free testing as a means of overall surveillance. USDA is looking into pilot project to determine prevalence of disease in a small identified population.
- Ancillary benefits of having a Coggins test likely outweigh changing requirements to decrease amount of testing. It is a benefit to the practitioner as it is a way to get onto the premises to discuss equine health issues and establish a veterinary client.
- High risk population definitions is different from the previously identified Gulf Coast region. Transmission to "organized" portions of the industry are at little risk from "pockets" of

disease prevalence. Additional challenges include potential differences in incubation times between the iatrogenic transmission and natural insect vector transmission. The current high risk racing QH industry needs to drive change in practices and rules need to be in place such as suspensions.

- Resources don't exists in personnel, particularly at the State level; furthering EIA control will not rank as a high priority in most States.
- Currently there is no research being conducted on EIA in the US. Research needed to identify incubation time and factors associated with transmission via a needle vs by insect vectors.

Equine Piroplasmosis (EP)

- EP is not a disease that needs an eradication program. Currently, EP is a bush track problem with spill over into sanctioned racing and getting tracks to require an EP test has been a challenge. However, the industry is losing surveillance in general either by States or racing commissions no longer requiring testing.
- The industry needs to take charge of this issue. The industry has the biggest teeth to enforce testing/surveillance more so than the tracks themselves. Testing could start with AQHA sanctioned events, but these events don't include a large percentage of breed events. The risk population is from sanctioned to non-sanctioned racing events. Tracks would benefit if EP positive animals were excluded from the event and the industry needs to work more closely with racing commissions.
- If the industry doesn't buy in on the importance of EP testing, they won't participate. Currently, the impression is that the majority don't know or don't care.
- Consequences of not having an EP program in the U.S. has not been an obstacle for trade/movement. However, if EP isn't managed or if testing domestically isn't required, the U.S. loses its justification for import EP testing. Also to that point, the advantages of having eradication program would be benefits to exporters, but in the big picture it may not be a resource priority.
- There has been support for targeted testing/surveillance as seen in Texas. The Texas approach to racing QH helped find disease and resulted in tracks implementing EP requirements for all horses entering Texas racetracks. When adequate surveillance of Thoroughbreds resulted in no cases, they were later exempt from EP testing requirements. Texas is continuing to work on increased enforcement; it has worked well on sanctioned events, and that is now carrying over to non-sanctioned events. Currently, they are checking papers, not actually testing. While it appears Texas has an EP problem due to a high-risk population, the reality is Texas is doing more surveillance and thus has better handle on the EP cases. Due to the success of the Texas approach, officials would like to see other States with QH racing require EP testing.
- Treatment cost for EP is $1,000-$1,500, using a drug labeled of dogs. Most treatment has been successful and gotten the treated horse out of quarantine. To help with EP eradication, States are encouraged to focus on QH racing population, surveillance needs to continue due to illegal imports, and bush tracks need to be found and managed.

Equine Herpesvirus-1(EHV-1)/ Equine Herpesvirus Myeloencephalopathy (EHM)

- From 1975 to 2000, only single digit cases were reported, but that number has continued to increase since 2000. While the cause of the increase in number of EHM case is unknown, suggestions include a single point mutation in the virus, the way horses are managed, and latency with reactivation and shedding of virus associated with a number of risk factors.
- Population of at risk horses include any horses that are moving and/or are grouped closely. With improved tools, there is better confirmation than what was once thought.
- Due to regular vaccination, not many cases are seen in breeding horses on breeding farms. Still, vaccination is not protective against the neuropathogenic signs.
- Triggers for EHM are unknown but may include physiological stress and increased respiratory rates and effort at competition; it is unknown if these things cause greater spread. Further, research is needed on latent infection, reactivation and high-risk populations.
- Concern voiced regarding how to handle latently infected horses that are recovered and test negative. Stress may affect horses if they are latently infected but there is a lack of research data on this subject.
- Control protocols seem to be working fairly well via track handling the implementation, there are a number of States that don't have regulations, there is a lack of Federal regulations, and we needs to be encouragement of individual venues to develop their own plan based around the USAHA EHM guidelines. Proposed control methods include outreach and education, more so than regulations.
- The USEF is developing rules that require each show to have a isolation protocol in place; other shows could piggy back through the actual facility and apply to non-USEF shows.
- An example of limited communication back to the industry and private veterinarians is the Ogden outbreak, which raised the question "Where should we have a presence?" While USDA sends out short newsletters, it seems people don't use the APHIS website. However, Extension outreach is a great source.
- For input on State regulations with industry involvement, a great example is Colorado working with rodeo associations on collaboration – not regulating, but open information sharing on hosting rodeo after a positive test. Letting the industry self-direct itself and determine whether or not to cancel events is positive, but more work needs to be done. In addition, collaboration between all stakeholders is important to facilitate ongoing education so there is awareness if there is an outbreak and quarantines/regulations come into play. Further, it is imperative to engage those hosting shows and overseeing veterinarians with regulatory folks on biosecurity and requirements.
- Reportability to States varies very much across States. Many States have diseases that are reportable, but reporting does not result in action. Many veterinarian practitioners are left to deal with a situation by themselves, as there is no State/Federal support or even resources. To move forward, a consensus must be drawn to have EHM reported to the State; biosecurity guidelines need to be widely available and common practice across the industry; the EDCC web page needs more emphasis and sharing; information needs to flow between Federal and State officials, State officials to veterinary practitioners and extension and from extension and practitioners to owners; there needs to be reverse feedback on better solving of problems – the grassroots has to be engaged; and the lessons learned from the Ogden event need to be communicated through equine lay press, as is being done through the wide distribution of the USDA Ogden survey results.

- The Ogden event also exposed perceived risks by industry. Many shows were cancelled subsequently and it had a major economic impact on all aspects associated with the event, including to associations, city hosting events, and general commerce, etc. Education is very important for biosecurity – standard operating procedures for shows should be implemented, and include input from owners/exhibitors and direct outreach to extension, veterinarians and race tracks. It is important to talk about biosecurity now and before the next potential outbreak. One-page protocols to veterinarians need to be distributed.
- Barrel horses are at high-risk for EHM due to the amount of movement they incur and exposure they have to each other. While it is unknown if EHV is endemic in the barrel horse population, current DNA research is looking at a strain.
- Risks for EHM include physiological stress and increased respiratory effort horses have while at competition; it is unknown if these things cause greater spread. Further, research is needed on latent infection, reactivation and high-risk populations.
- A microchip with a temperature sensor is great way to get a temperature read and to monitor horses, but its accuracy is still in question and researchers question the viability of this as a practical tool due to its variability. Practically speaking, it is useable to show temperature spikes for monitoring and would offer application in the instance of a large disease outbreak.
- The issue of vaccination was discussed in respect to when to vaccinate and what products to use. Many agreed that EHV vaccination is used throughout the industry with varying protocols. The general thought was that an inactivated EHV nasal vaccinations may have a quicker uptake and well vaccinated horses may possibly be less likely to get disease, but there is no science on this currently.

ENDEMIC DISEASES

Influenza

- Current high risk populations include show/race horses, young to middle aged horses, performance horses and older/previously exposed horses. Misconception in the industry is if the horses has been vaccinated they are all protected from disease
- Scientific knowledge gaps that exist include vaccination efficacy in light of genetic mutations every 10-12 years. Related to vaccination which is more effective modified live or killed vaccines, is there a perceived or true vaccine failure.
- Vaccine protocols vary with vaccine companies but some are reimbursing diagnostic costs if the horse contracts the disease and the horse was vaccinated by a veterinarian.
- Control of influenza is challenging as it is difficult to isolate a positive horse 150 feet away from all other horses. One of the few diseases that presents with cough, thus presents a unique set of challenges for controlling the disease. Owners are reluctant to move horses far enough away to reduce the risk of spread.
- Influenza is a reportable disease in Florida and Kentucky but there is no action on that reporting; strictly for surveillance purposes. Practitioners question the benefit of reporting an unregulated disease and question the potential privacy/confidentiality issues.
- Testing should be elective but it is difficult to convince practitioners that don't test to start testing. Testing can help determine the follow up care of horse.

- Influenza is shed for a shorter period of time than *S. equi* or EHV; this fact could be used to help convince clients to do testing.
- SAHOs can be more proactive in addressing influenza concerns by ensuring more reliable reporting of incidences so any changes in number of cases can be documented. States need to work together to see if there are trends for increases in flu cases or if there is a more widespread problem.
- Industry can assist by increasing vaccination and maintaining thorough records of vaccination. This information could assist in addressing vaccine efficacy. European countries use an equine passport to record vaccinations; could the U.S. implement this passport protocol through voluntary/incentive program.

Strangles

- Strangles risk populations include travelling show horses, untested unvaccinated sale horses, horses in rescue facilities and slaughter horses.
- Typically, collection of swabs for testing are recommended by veterinarians but due to increased cost, owners are hesitant to utilize testing.
- Industry does not perceive strangles as concern as it is not spoken about in media.
- Not prevalent in all States, States that don't see it as often pay attention to incidents more than States that see it frequently. Typically, strangles is not on State reportable disease lists. However, Florida requires reporting of strangles, and they immediately send out VMO's to help with biosecurity of property to reduce risk of the disease spreading.
- Vaccination is not routinely practiced as it is considered that the benefit of vaccination does not outweigh the risk of adverse reactions.
- Owners who have experienced a strangles outbreak are much more likely to comply and test for strangles than those who have not
- Research of economic impact of strangles would bring a lot more light to this disease
- Need to identify the carrier State. Best practices may or may not get rid of the disease, horse may become carrier
- Industry needs a way to know what is happening in the area with diseases such as strangles but over regulation is just going to put a strain on the State health officials.
- There needs to be increased diligence of owners on biosecurity measures and treatment of horses that present symptoms.
- Biosecurity and best management practices are most important for this disease.

Pigeon Fever

- Currently, the industry perceives this disease as a low risk. However, changes in geographical prevalence is cause for concern, especially since the causative bacteria can live in the soil. It can become much more widespread and a much bigger concern. Therefore need to screen for it more, and make it a reportable disease.

- Disease was more prevalent years ago and is now starting to come back, is this resurgence caused by weather changes or change in movement of horses?
- Disease can be easily confused with other similar diseases and because it is trans-geographical it needs to be watched more closely
- Presentation is changing; it affects every horse differently and we don't know how to get rid of it. Flies have been found to be a carrier. Vaccine is now being developed.
- Research is needed on the disease and risk factors. Owners are much more educated than they used to be just a few years ago, we need to use this to our advantage and inform them of the importance of preventing and controlling this disease. Specifically owners need be informed that fly control, especially on the ventral abdomen, is most beneficial.
- Recommend that disease become reportable but not actionable as this will help us learn more about the disease and owners could be advised of best management practices and take care of their horses. It would be most beneficial if the disease was reported when it is introduced in a new area. Veterinary practices in that area, could then more readily service their clients based on their local needs if a disease is reported and that report is sent out by State veterinarians.

BIOSCECURITY AND MOVEMENT

Biosecurity Discussions

- The consensus of the group was that everyone has a role in biosecurity. Private practitioners are key in informing equine owners. Competition veterinarians should be provided with packets that include items like drug rules, biosecurity rules and isolation protocols; packets should be tailored for each event.
- Outbreaks are good learning tools and have raised the question of where positive horses can be taken as soon as possible. Those involved with an outbreak need to be looking at implementing quarantine quicker; since there is no listserv for equine facilities, there is a need for social media to link all equine folks together.
- The American Association of Equine Practitioners (AAEP) serves the public very well; it was suggested that the AAEP provide training and subsequently issue a biosecurity accreditation. The training hat would direct veterinarians in what samples to take, where to take suspect or confirmed contagious animals, etc.; an accreditation session like this could be added to the AAEP annual meeting. Creating a demand for this information should come from industry, and certification endorsement might help create that demand.
- It was also suggested to utilize smartphones and apps, and resources such as videos and emails. Events could send information regarding potential exposure through these means. For example, an alert sent by phone may read, "Your horse has the potential to have been exposed…"
- Biothermal chips read the temperature of the horse and caveats to functionality as well.
- Specific to biosecurity, the discussion concluded with educating owners so they demand more of event organizers, event organizers advertising that they have a biosecurity plan, having a biosecurity "expert" veterinarian on site during events, creating expectation in participants, creating an participant request to event organizers that they want to be

confident that risks are being managed by their organizers and organizers wanting to deliver.

- The more communication that can be done, the better as it is necessary between the different segments of the horse industry. It was suggested to identify where people are getting their information (private vet, online, feed store, etc.?). Need to identify who is going to promote the message and how momentum is going to be created.
- The USEF is either going to add to their emergency plan or create a separate detailed plan for handling sick horses. Further, isolation plans are also in the works as some facilities don't have enough isolation areas.
- Whose role it is to do infection control at the show? While the first answer to come to mind may be the official veterinarian that is contracted by the event, it's not always that simple; for example, the veterinarian that was contacted to be on hand at the show may have just come from pig show or may not be an equine vet.
- Private practitioners need to provide a portfolio of services to sell including biosecurity – people respect what they pay for. Still, owners need incentive to reach out to their private practitioner to promote it to events. For example, a veterinary practice in Kentucky charges for a biosecurity assessments – the sellable moment is when the owner is in the middle of a disease outbreak. If infection control plan is prepared in advance of an outbreak, vets and owners will be much more willing to participate. Also, event veterinarians could get a certificate to validate a skillset they can market.
- While it's still unknown what role State regulators would play, small steps are being discussed now – it's not necessarily easy to move forward. Guidance is needed from the top and event organizers may need a bit of pressure from the top down/bottom up. In some ways, event centers are equivalent to landlords in that associations hosting the event mostly deal with the incident. Decisions have to be made about what to do with the quarantined horse(s) and how to move healthy but potentially exposed horses back home (seal the trailers?). Exposed horses that aren't showing clinical signs could be sent home via a permit agreed upon between the States.
- As an example, it was mentioned that farms in Europe that have insurance get a discount because they have an infection control plan. It was asked, "Could events get a better deal on insurance if they have an infection control plan that could reduce risk of a disease outbreak?" Though there isn't a firm answer right now, the consensus was anything is better than nothing; the industry-driven secure egg supply was sighted as an example.
- Funding for enhanced biosecurity is the biggest challenge, especially from the event manager's perspective. Not having pre-planning makes it difficult to handle a disease incident. It was suggested a toolkit needs to be implemented and isolation protocols need to be enforced by USEF next year by a trained person. AQHA has shared a business continuity plan with AQHA event organizers, but doesn't enforce its use.
- It was suggested that event veterinarians be a resource in development of an infection control plan for each event, as they are a trusted resource; event veterinarians could have a checklist and make sure signs are posted regarding management tactics, like not sharing buckets, etc. Part of their job would be to monitor that these guidelines are being followed during events.
- One of the biggest challenges right now is that there isn't consistency in infection control plans for events – guidelines vary from event to event. A framework needs to be laid out for

each event, like the business continuity plan in Colorado. Adopting a national framework should be considered, i.e. come up with the 10 commandments of biosecurity.

- The idea of a biosecurity fee that each contestant pays was suggested, with the question about whether or not attendees would feel more secure. With a fee structure, it was questioned if events/officials would "kill the industry we're trying to save." But sitting by and doing nothing about these issues isn't an option, either, especially when thinking isn't as clear in the middle of a crisis.
- Education needs to be targeted at veterinarians as well as owners. A checklist for biosecurity for equine events has been created and given out for free for years, but it would it have more value if there was a charge to acquire a checklist tailored to each event? It was also questioned if the checklist had been presented to at an AAEP meeting.
- There is a financial interest at stake to have boots on the ground – private practitioners.
- It was suggested that the people who don't have a plan in place, will have one after an outbreak. It was reiterated that communication is key, and damage control is afterwards. The conversation came back to whether or not State or Federal officials actually are going to get involved.

Interstate Movement Discussions

- The question raised; "Do we need to harmonize our rules for interstate movement?" As an example, Utah gets calls from equine owners asking if they can go through the State; Utah equine Extension has intrastate and interstate requirements in place. But it is not the folks who call for information that we need to be worried about – it's those who don't call to check.
- It's also hard to tell if anyone is actually looking at health certificates, which are good for 30 days (how good are they really if the horse could have gotten sick during this 30 days?). Due to lack of State and Federal regulatory limited resources, there is challenges in compliance enforcement. Until events or other commingling points start looking at health certificates, how can they be regulated? Collaboration is needed between private and regulators to stimulate rapid sharing of information. When signing in at event, veterinarians need to look at certificates and record that it's been viewed. From a veterinarians or event officials perspective, checking all health certificates is ugly, it delays entering into the facility. For owners, equine passports need to be updated every 30 days.
- The 2015 USAHA Resolution 6 requested USDA record and electronically capture the name and description of all Mexican imported horses.
- It was questioned if there was a way to get a Port of Entry electronically (like as a picture on a smartphone or through Googleforms). It would need to be known when they come through and where they are headed. Global Vet Link (GVL) has electronic access for horse events, they just need a point of reference (from practitioner) and are waiting on compliance especially for an annual event.
- Still, a challenge is that horse owners are not worried about health certificates and need incentive to track their events/travel, there is a need for traceability technology.
- In many rodeo horse cases, there is no tracking of where they've been. For large equine events, it was suggested to require a passport itinerary.

- Still, the consensus of the group was that CVI's aren't worthless because they get people who want to comply to have vets look at their animal. Another idea was to acknowledge a time frame (3 days' time basis) or have events check entries every so often (every 20th horse, for example). It would be like having a driver's license: it's not checked every day, but you know you have to have it to be in compliance.
- While it's still up for debate of who needs to explain the importance of these issues (event sponsors?), they need to be explained to owners
- There is a tremendous need to find a mechanism for tracking horse movement; self-certification online (as in what Maryland did when there were budget cuts) was suggested as State inspectors don't need to be there to check every certificate.
- While there is plenty of information out there from Federal and State sources, owners may be talking to different people at State offices and get different answers. It's imperative to educate grass roots/people that own the horses – they need to see it as a need and to add value – and, it has to go beyond a paper certificate to an electronic format.
- An equine passport (6 month certificate) would aid with self-reporting and compliance, and also needs to be electronic. The Arabian horse association has just started an equine passport program to track where horses are going; the information is strictly for personal tracking and is currently a paper method. International movement of horses was the driving force that started the passport process. While electronic forms would be ideal, it has to be compatible across the board – all venues would have to have it. Also, a central database would need to be utilized, likely through a privately-held (by chip) company, which may create barriers for getting it adopted. Further, it would still be a voluntary program – so, like a credit card with the microchip in it, it could take years to implement. And while it would require temperatures, thermos-chips (not quite as accurate) and health monitoring at events, it would also would go far beyond a 30 day health certificate and would have traceability tacked onto it. In that vein, smartphone technology would be utilized for tracking – like with a boarding pass, but someone would check passes before boarding. Or, like a QR code, alerts would be released in real time.
- It was reiterated how frustrating it is to come from out of State for an event without in State animals being required to have a CVI – that's why value needs to be added.
- Discussion continued about what the industry perspective on equine passports is for interstate movement, which resulted in answers that there is no consistency, even with cattle. GVL currently has 20 percent of States participating in their interstate regulation website. Recommendations from private practice seem to change from day to day.
- Where health certificates are concerned, the thought is that many owners think of it as a piece of paper to be thrown away. While it does enable owners to get around a port of entry, it's only good for a limited amount of time. The document is not indicative as to where the animal has been or is traveling to. Those that want to comply, comply – those that don't want to comply, don't. It is unclear whose job it is to enforce owners have a health certificate.
- Health certificates can also be written in various ways, depending on if the animal is being sold or transported for event. It was suggested that random spot checks at shows would be a good idea. For example, a field investigator was on hand at shows in North Dakota to spot check certificates and was happily surprised to find they were in compliance. Fines were issued for those not in compliance.

- A pilot program in New Jersey is testing smartcards for horses to allow people privileges to upload info to that horse's chip. This makes things simple because devices are at most people's disposal via smartphones or a scanner on the phone.
- It was suggested the USDA APHIS VS should set a minimal regulation/guideline; for example, all States need an EIA test.

International Movement

- Where international movement is concerned, owners are directed to contact USDA, though State level officials get lots of questions. Owners have, however, reported that USDA phones weren't answered and they can't get in touch with anyone, creating the mindset that access and timeliness are not available from USDA. It is still unclear if there is enough information out there for importing/exporting horses.
- Shippers often have a good grasp as to how international movement works. Things that go into consideration are the cost to an owner to battle that paperwork versus pay a shipping agents to do the paperwork for importation The field VMO should be able to take a request for information and get info out there, but USDA service centers are overwhelmed with certificates and there is a feeling of lack of assistance from USDA. Owners may have to call/email the importing country directly since all regulations are different – it may be quicker than waiting for a response from USDA. Shipping agents handle things efficiently.
- There are big discrepancies on health certificates, as the certificates that are good for 30 days, while Canada's certificates are good for 60 days. Another concern are illegal horses coming from Mexico that do not go through quarantine with USDA.
- Change the industry reportedly would like to see are cooperation with bordering countries; currently, USDA has no sway with Canada changing requirements related to Vesicular Stomatitis and its holding up exports to Canada because of an outbreak in one county in Texas. Most States don't have intrastate movement restrictions, which can lead to diseases that can move about.
- Final discussion was about imported horses and how USDA isn't holding or certifying them, and there are different degrees and requirements for testing/regulations. USDA is only certifying that the animal is free of specified regulatory disease and free of visible signs of disease at time of release from quarantine.
- In the area of international movement, interpreting the papers are not easy – those involved cross their fingers hoping they are correct. High health/high performance is looking for a way to transport under uniform, standard "bubble-to-bubble" with less time in quarantine, though it's not known how palatable this option will be because of concern about how well maintained the bubble will be . Also, it takes lot of work to maintain a bubble – who's going to check it? A practitioner will have to verify this. Documents of how horses need to be maintained (high horse/high health) are on the OIE website. An idea for an equine disease free zone outlined in the document is that all horses in a particular area have to have a certain health status. The idea has been field tested, but to accomplish the protocols on a large scale would be expensive. While movement criteria has been provided, there are a lot of practical things that will need to be worked out if there is to be a high performance/high health category.

NEXT STEPS

While the forum brought together equine industry professionals, including association leaders, veterinarians, pharma representatives and regulatory animal health officials to gain a better understanding of equine disease issues, the seriousness of equine diseases calls for further dialogue and cooperative efforts to be sustained going forward. NIAA & USAHA will continue to provide leadership within the equine industry and establish a platform to develop further collaboration whereby equine disease control solutions can be developed from the perspective of science.

Highlighted below are potential areas of future exploration in the advancing of equine health.

Communication

- Development of a national equine health messaging system which utilizes technology for information dissemination (i.e. apps, videos, text messaging, emails, twitter)
- Promotion and support of the Equine Disease Communication Center (EDCC) as THE resource for equine disease updates and information. Securing EDCC funding, streamlining information flow, capitalizing on technology, better utilization of social media and accessing grassroots industry members.
- Continue to support sources of reliable equine regulatory disease information for industry communications which includes the Equine Disease Communication Center (EDCC); and monthly national equine industry conference calls for State, Federal and industry members hosted by Dr. Kent Fowler.

Collaboration

- Pursue obtaining adequate national equine census and economic data.
- Advancing biosecurity requires horse owner acknowledging the importance of biosecurity, industry demanding improved biosecurity at all levels and private practitioner receiving training and certification of biosecurity skill set.
- Microchips are the future solution for equine traceability. We are at a point, where the equine industry needs to promote and encourage individual animal identification, specifically the use of microchip. Various equine stakeholders are promoting microchipping but there is a need to ensure consistency in use and recording of microchip information used in horses.
- The industry needs a mechanism to access microchip data in a timely fashion, whether it's for tracing a diseased animal or re-uniting a displaced animal during a natural disaster. Future industry discussions are necessary to finding solution to the best way to create a microchip repository.
- Utilization of technology is necessary for advancing the health of the equine population within the United States. Development and implementation of an electronic systems for information dissemination and disease surveillance is necessary.
- Enhance communications between State and Federal animal health officials.

Research

- Fund research to assess knowledge gaps related to equine health and identification of new disease control strategies.
- Research to identify the incubation time and transmission factors of needle vs insect transmission of EIA and EP.

- Academia, regulatory officials and industry to collaborate on the collection of disease outbreak data to be utilized for researching mechanisms of advancing equine health.

Additionally, participants shared ideas for advancing equine health. Below is a summary of ideas by designated entities for future discussions.

Industry

- Active industry engagement in regulatory issues at the local, county, State and national level. Participation in local horse councils/horsemen associations, State animal health official advisory committees or tasks forces, and United States Animal Health Association/ National Institute for Animal Agriculture.
- Industry to provide subject matter experts to State Animal Health Officials, especially in States with limited equine expertise on staff.
- Industry organizations to promote implementation of biosecurity; assist in disease prevention efforts through industry driven health monitoring activities at commingling or concentration points.
- Industry to solicit new Federal funding to address equine health issues at the national level.
- Industry to support standardization of disease reporting and disease control through the implementation of Federal rules for equine regulatory diseases.
- Industry to drive change in practices to address the iatrogenic transmission of EIA and EP in the high risk populations.
- Industry to support and encourage racing jurisdictions to require the EIA and EP testing of the high risk racing Quarter Horses prior to the entry to the racetracks.
- Industry to explore the feasibility of implementation of U.S. passport protocol which includes vaccination history through a voluntary/incentive program.
- Industry needs a way to know what is happening in the area with diseases such as strangles but over regulation is just going to put a strain on the State health officials.
- Industry to explore feasibility of insurance discounts for events which implement infection disease control plans.
- Industry to assist with equine health monitoring and compliance by requiring health certificates or owner declarations of health at events and performing compliance checks for these documents.
- Industry to prioritize equine Federal regulatory authority deficiencies (diseases, interstate movement, and international movement), garner industry support for Federal regulations and recommend Federal recommendations (USAHA resolution process, industry lobbying process and direct industry requests to USDA).

Practitioners

- American Association of Equine Practitioners to provide outreach and education for practitioners on biosecurity.

- Recommendation to task the American Association of Equine Practitioners (AAEP) with creation of a biosecurity accreditation session that would educate veterinarians in what samples to take, where to take animals with suspect or contagious diseases, how to implement barrier precautions etc.; an accreditation session like this could be added to their annual meeting.
- Targets for advancing practitioner's roles includes enhancing communications on regulatory issues and focusing on biosecurity services.

State Animal Health Officials

- States to solicit assistance from local equine industry to identify and address the equine health issues of industry and regulatory importance.
- Potential feedback mechanisms for within State communications include the State veterinarian and State level equine advisory committees/councils. Outreach mechanisms include newsletters, social media, disease reports and presentations.
- SAHOs can be more proactive in addressing influenza concerns by ensuring more reliable reporting of incidences so any changes in number of cases can be documented.
- Each State to designate an equine subject matter experts which can be industries point of contact within the designated State.

Federal Animal Health Officials

- Development of Federal rule to address current deficiencies related to the control Equine Infectious Anemia.
- Develop outreach to increase industry awareness of Equine Infectious Anemia and the current high risk populations.
- Identification and evaluation of surveillance streams possible for Equine Infectious Anemia testing of the untested population.
- Harmonization of import requirements with respect to performance horses by different countries is a work in progress. Facilities used for post-arrival quarantine in the U.S. should be reviewed from the viewpoint of affording the opportunity to maintain performance fit sport horses are adequately exercised while in quarantine.
- Suggest Federal communications include industry feedback mechanisms and USDA output mechanisms. Output mechanisms include newsletters, social media, disease reports and presentations.
- Designate a Federal animal health official subject matter expert in each district to be a point of contact for industry and States.
- USDA to host a State/Federal animal health official equine conference calls on a routine basis to discuss current equine regulatory health issues.

While the forum succeeded in bringing together experts from diverse backgrounds to discuss advancing equine health, participants and organizers understood that these efforts are the initial step forward and

must lead to further dialogue and cooperative efforts to achieve the goals shared by the many stakeholders. NIAA and USAHA will continue to provide leadership within equine industry to establish a platform to facilitate collaborations for identifying and helping to implement solutions for advancing equine health in the future. A second Equine Forum will be held in January 2017 focusing on Equine Traceability and Biosecurity.

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FOOTNOTES

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