Researchers: The Stigma of EIA is Misplaced

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March 04 2007, Article # 9038
TheHorse.com

Equine infectious anemia (EIA), also known as swamp fever, is a viral infection/disease of equids that has been largely controlled in the United States through application of Coggins testing since the early 1970s. In many areas of the country, especially where testing for antibodies to EIA virus (EIAV) has occurred in a high proportion of the population at regular intervals, the chance of finding test-positive horses approaches zero. In other areas of the country where annual testing has not been the tradition, EIA has been found in recent years on a number of specific premises or in free-roaming populations at rates exceeding 30%. This article is written to help horse owners understand the risks associated with not testing for EIA, to help put the risk of acquiring EIA in its proper perspective, and to promulgate recommendations for the more effective control of EIA at the national level.

Yesterday and Today

Although each year about 300 new EIA test-positive horses are discovered in the United States, most are without overt clinical signs of the disease. Strains of EIAV that were associated with severe clinical disease, including rapid progression to death, were relatively common before testing was widely used. Today the vast majority of horses found positive on the approved serologic tests for EIA are "inapparent carriers" of EIAV. As EIAV induces persistent infections, these carriers are infected for life and have EIAV in their blood at all times. The level of EIAV in these individuals might be low today, but EIAV mutates at a high rate and has the potential to increase its replication at any time. Thus, we recommend the application of the same controls for the movement of all test-positive horses, regardless of their clinical status.

Today control of EIA depends on horse owners testing their equine charges to identify the carriers of EIAV. Most states have some regulations/rules/laws concerning EIA, at least requiring testing of horses coming from another state. Regulations imposed on the maintenance and movement of test-positive horses usually discourage the owners from keeping them. For example, test-positive horses should be segregated from other horses by at least 200 yards (440 yards by law in Arkansas) or segregated by 200 yards and isolated within a stall screened to exclude biting insects (enforced by several states). Few states have permitted the establishment of quarantine farms for accumulation of EIAV carriers; none have actively encouraged them.

The result of a positive test is often the destruction of the EIA test-positive equid, a recommendation made with due deliberation and concern by the American Association of Equine Practitioners (AAEP) and most regulatory bodies.

In this paper we will describe the way horses acquire EIAV. Then we will discuss what testing for EIA means, leading to a list of recommendations for the control of EIA while taking into

account the true risks associated with EIA and horse populations. For this exercise, real data from the Uintah Basin in northeastern Utah in 1998-2000 will be used.

Too often owners and regulators alike overreact to the discovery of a test-positive horse in their area. We hope this paper sheds some light on the risks these test-positive animals pose, and that it helps reduce/eliminate the stigma associated with being "within 30 miles" of an EIAV carrier. In our opinion, for us to reach the next level of success in the control of EIA, we need to develop and implement more "user-friendly" testing options, e.g., at points of congregation, especially in areas where testing has not been the tradition. Only then will the previously untested reservoirs of EIAV be discovered.

What Causes the Disease?

The disease EIA is caused by a lentivirus related to HIV, the cause of AIDS in man. EIAV is known to infect only members of the horse family (horses, donkeys, mules). More information on EIAV and more details on all aspects of EIA can be found on the Internet at www.aphis.usda.gov/vs/nahss/equine.

Replication of EIAV is observed at highest rates early in the infection period (actually before the horse is positive on tests for antibody) and during times when clinical signs are evident. During the first clinical episode, increased body temperature (fever) is seen, often accompanied by decreased activity, loss of appetite, and a decrease in platelet counts. As this initial episode is very short-lived, it is generally not seen by the owner or by an attending veterinarian. The fever, even in excess of 105 degrees F, often will go unnoticed in pasture settings, and the loss of appetite might last only a few hours.

If the horse survives this initial bout, it becomes positive on tests for antibody (usually within a month of exposure). Some horses develop the chronic form of the disease with recurrent clinical episodes, accompanied by fever, more severe decreased platelet counts, anemia, dependent edema ("stocking up"), profound weight loss, and other classical signs associated with being a "swamper."

Only rarely does the first clinical episode proceed without abatement and the horse die within 20 days of infection. This acute form of EIA is seen infrequently today, but can be produced by inoculating high doses of some virus strains isolated before 1970 and maintained in the laboratory.

The most common response of horses to infection with EIAV strains today appears to be one with a minimal initial response, usually not observed by the owner, followed by an apparent complete recovery, and with no overt clinical signs of disease for extended periods. These inapparent carriers of EIAV also become positive on tests for antibody for the first time usually within a month of exposure and remain positive for life.

It appears that genetic factors of the host and the virus are responsible for interactions that determine if the exposed equid will develop disease following infection. For example, strains of EIAV that can kill horses within 20 days might cause no clinical disease in donkeys. Likewise, a

strain of virus that induces disease in ponies can have changes in about 10 (of about 8,000) nucleic acid building blocks and lose the ability to cause disease. As lentiviruses have a marked tendency to mutate, we must assume that each infected equid has the capacity to serve as a reservoir of infection with the potential to generate strains of EIAV capable of causing disease in a high percentage of exposed equids. Fortunately, the potential does not appear to be realized at a high rate today.

Transmission of EIAV

Blood Transmission of EIAV generally involves transfer of blood from an infected horse to an immediate contact. This can happen most efficiently when man is involved, e.g., by using blood-contaminated syringes and needles, bloody hands, contaminated bits, and other inanimate objects. The transmission of blood between horses by man can be totally eliminated through the application of good management practices, cleaning and disinfection, and, most importantly, by knowledge of the EIA status of each horse. In the absence of man, blood transfer between horses can occur through trauma and fresh wounds, either by direct contact or by contact with contaminated surfaces, e.g., posts or chutes.

Most transmission of EIAV is thought to occur following the interrupted feeding of insects. The blood-feeding insects most important in EIAV transmission appear to be those who inflict painful bites that induce defensive host behavior which, in turn, interrupts the blood feeding. This means when horse flies and deer flies are interrupted and seek another host, the mouthparts of the insect (potentially contaminated with EIAV) transfer blood mechanically to the second host.

If horses are separated by increasing distances, the likelihood of vector transmission of EIAV decreases exponentially. Thus a barrier of 200 yards is considered more than adequate to break transmission. It is all a game of chance, but you can avoid the game altogether by knowing the status of your horses and only allowing test-negative horses to commingle.

Secretions/Excretions Although blood is the most common vehicle for transmission, it is possible to find EIAV in secretions and excretions of EIAV-infected horses showing acute clinical signs of disease. Recently we have noted a significantly higher rate of infection in mature/dominant stallions compared to mares in wild, free-roaming populations with EIA. This raises the suspicion of transmission of EIAV through wounds/bites encountered during combative male behavior. If this is the reason, blood is most likely involved, but transfer though saliva cannot be ruled out. It is of interest to note that a related lentivirus, feline immunodeficiency virus, is transmitted mainly through bites. With this information it is prudent to consider all secretions and excretions from EIA test-positive horses as potential vehicles for transmission.

Venereal and Transplacental Transmission As secretions and excretions from test-positive horses are potentially infective, what is the risk for transmission during breeding or to the developing fetus? Reports in the literature suggest that both can occur, and the risk is greater if the individuals are showing signs of disease. The greatest risk for transplacental (across the

placenta) transmission is seen if the first exposure occurs during pregnancy, as the highest level of virus would be expected early in the infection, at an early stage of fetal development.

If the stallion/mares are inapparent carriers of the virus, the data suggest that they will not transfer the virus during the act of breeding or to the fetus. In fact, a surprising majority (greater than 90%) of foals of test-positive inapparent carrier mares have been raised free of infection, even if the foals were allowed to pasture alongside the mares until normal weaning time (six to eight months of age) in areas of high vector populations.

Stability of EIAV outside the horse There is no evidence for the multiplication of EIAV outside of equids. Thus, any virus on insect mouthparts, in insect abdomens, or deposited on inanimate objects has a limited life span. In limited studies, groups of 25 horse flies were able to transmit EIAV 30 minutes, but not four hours, after taking a partial blood meal from a horse with acute signs of EIA. The extinction of EIAV infectivity in blood/secretions in the environment is not known precisely, but would be expected to parallel that of HIV. Thus, we should exercise caution to protect our horses from contact with blood/secretions from horses of unknown status, just as EMT professionals wear gloves when handling accident victims.

Testing for EIA

Most horses exposed to low doses of EIAV through insect bites become positive for antibodies in the official tests for EIA between 21-42 days after the exposure. This is referred to as the incubation period. This information is used in the uniform methods and rules for the control of EIA to establish a safe time of quarantine, i.e., retest the horse at 60 days after a known exposure.

At this time we have a variety of testing options for detection of antibodies against EIAV. The agar gel immunodiffusion (AGID or Coggins) test is still the test of choice in many laboratories and is the only test for EIA that has been correlated positively with the presence of EIAV in the blood. The AGID test has stood the test of time, and after 35 years of use remains the international gold standard serologic test for EIA. The AGID test is conducted in the laboratory and requires an incubation time of at least 24 hours for the lines of reaction to become evident.

There are four enzyme-linked assays (ELISA tests) for detection of antibodies against EIAV. These tests can give results in a matter of minutes, but if a positive result is found in an ELISA test it must be confirmed in the AGID test. The AGID test and three of the ELISA tests look for antibody against the same virus protein--the major core protein called p26. The fourth ELISA test detects antibody against the transmembrane protein called gp45 and/or p26, but does not discriminate between them. Thus, effectively, all diagnostic tests for EIA are looking for antibody in the horse against the same virus protein, p26.

Each of the available official tests for EIA has inherent strengths and weaknesses; by combining them we can deliver the most accurate diagnosis possible. In the rare cases where official test results do not agree, the research immunoblot test is used, which can detect reactions against all three major EIAV proteins, p26, gp45, and gp90. Incidentally, the immunoblot test (and derivatives of it) are used as the confirmatory serologic tests for HIV infections.

What Does Testing for EIA Tell Us?

A negative test says that today the horse does not have detectable antibody against EIAV. If the horse in question has been in quarantine for the preceding 60 days, we can say that it is not infected. If the horse has not been quarantined and all equids it has encountered in the last 60 days were not infected, and if all of their contacts were not infected, we can say that the negative test means the horse is not infected. Can we be 100% certain of the status of the horse? No, but we can approach it (greater than 95% confidence) by applying tests to all horses that congregate. Without testing, it is all a crapshoot.

Uintah Basin Lessons

The Uintah Basin in northeastern Utah is a unique, high desert region surrounded on the north by the Uinta Mountains, on the west by the Wasatch Range, on the south by the Book Cliffs Range, and on the east by the Rocky Mountains. The area is a difficult one from the aspect of disease control in horses because it is populated by domestic and feral free-roaming horses owned by private individuals, the federal government (wild horses under the aegis of the Bureau of Land Management, BLM), and the Ute Nation, ranging freely on lands owned by private individuals, the state of Utah, the BLM, or the Ute Nation.

Historically, testing for EIA has occurred in this area at a relatively low rate each year, and with a very low rate of test-positive samples. Focus on this area intensified during 1998 when a number of privately owned, Ute tribal, and BLM free-roaming horses were tested for EIA and found positive (127/1,033). The majority of the test-positive horses originated from one geographic area near the confluence of the Green River and the White River. These horses had opportunity to roam and commingle freely during the preceding years, as no intact fences and no physical boundary had been sufficient to keep them separate. In many cases the ownership of the horses could be questioned, as the majority bore no brands or other permanent identification marks.

In the other areas, separated by up to 30 miles from the index cases, testing revealed a low rate of test-positive horses (7/599). All seven of these positive horses were thought to have originated from the index area (three horses) or were owned by the family that owned the majority of horses in the index area (four horses).

These findings precipitated much local discussion and encouraged local leaders to cooperate and sponsor an area-wide testing exercise for EIA. Initially some local owners viewed this increased testing skeptically, as the rate of infection and disease in the domesticated horse population was assumed to be zero.

This presumption of freedom from EIA contrasted sharply with the reported reaction of a buyer of an exceptional performance horse from the Uintah Basin. When the horse was delivered to its new owner in another state and the buyer realized it was from the Uintah Basin, it was rejected because of the stigma of EIA.

Who was right? Was the assumption of "no EIA in the Basin" correct or was the fear of EIA in the potential buyer justified?

We agree that the reaction of the buyer was an overreaction to the real threat of the infection, but could the buyer be sure the horse originated from an EIAV-free facility? Had it been quarantined for 60 days prior to its last test for EIA? Had it been released to run free on the open range, commingled with wild free-roaming horses, and captured at a later date? Does surveillance for EIA in the Uintah Basin inspire confidence? What about your neighborhood or community?

It is only through the application of testing that we can have relative assurances of safety from EIA.

The horse community in the Uintah Basin broke the western tradition of not testing for EIA because of the discovery of EIA in free-roaming horse populations in this open range country and its impact on business. An unprecedented amount of cooperation on control of EIA occurred between the local governmental agencies, federal BLM leaders, Ute Tribal leaders, the Utah state veterinarian, and veterinary researchers. Local events sponsored in the Basin included a testing clinic in April of 2000. Accredited veterinarians in the area participated, with help from veterinarians and students from Utah State University and veterinary schools in Louisiana and Oklahoma. The state veterinarian cooperated to effect horse-side testing for EIA, and test kits were donated by the manufacturers.

Control of EIA in this type of situation, where free-roaming horses owned by private individuals and two sovereign nations represented a sizable proportion of the population, required novel cooperative plans.

Recommendations for the Control of EIA

1. Test all of your equids for EIA, not just those for which it is required. Consider doing this when they are less mobile and when blood-feeding insects pose their lowest risk, e.g., during the winter months.

2. Require a negative test for all changes of ownership. If the status of all contacts within the last 60 days is not known, make the sale contingent on a negative retest in 60 days. Consider quarantining the animal until the negative retest is obtained.

3. Require a negative test for all equids at congregation points. Even if the state does not require it, make and enforce event regulations and prohibit entry to those without evidence of a current negative test.

4. Encourage the development and delivery of "horse side" testing for EIA. Today, all testing for EIA occurs under the aegis of the state and federal authorities in designated laboratory settings. A revision in policy might be required to authorize "horse-side" testing. In our opinion, we need to facilitate the delivery of EIA testing to equids that have eluded our surveillance to date.

5. Work with your neighbors to effect area-wide protection. Once you know the status of your equid, expand your sense of well-being by understanding the local risks of exposure.

6. Consider the establishment of quarantine farms for inapparent carriers of EIAV in your area. When the risks of keeping EIAV-infected equids in safe quarantine (200 yards segregation) are compared to the risks you face by freely commingling with untested equids, it is clear that it is millions of times more dangerous to commingle with untested equids. In cases where destruction of test-positive inapparent carriers is not acceptable, safe and closely monitored quarantine farms could provide useful options to the industry as we reduce the overall risk of exposure. Work with your state veterinarian, discuss the options, and understand the risks.

7. Maintain as much distance as possible between equids that have not been tested. EIAV is spread between equids in close proximity. The more time they spend together during the "vector season," the greater the chance of transmission. This can be avoided if you only commingle equids after their test status is known and their background is understood.

8. Place the emphasis of EIA control on the untested equids. EIAV is not known to be spread by aerosol and usually spreads within a population slowly, unless man helps. But the potential for rapid spread always exists. Separation of untested equids by 30 feet might reduce transmission by insects considerably. A much better form of insurance against EIA is testing.

9. Cooperate with local, state and national authorities to develop meaningful and effective programs for the control of EIA, e.g., testing by risk rather than by regulation (see related article The Control of EIA Should Take New Directions"). In our opinion, the horse-owning public can control the spread of EIA by applying the recommendations promulgated by the US Animal Health Association in 1974. The addition of rapid ELISA tests for EIA makes design of more effective programs possible. Help convince the veterinary community of your concern for expansion of testing for EIA in areas of greatest need.

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