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Equine Viral Respiratory Pathogen Surveillance at Horse Shows and Sales

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ABSTRACT

Equine respiratory viral infections cause significant worldwide disease and economic loss. Common causes include equine influenza virus (EIV) and equine herpesviruses-1 and -4 (EHV-1 and -4), and risk of exposure to these agents may be highest in young horses commingling at sales and competitive events. A surveillance study was conducted at two horse shows and two Thoroughbred sales to determine whether horses shed EHV-1, EHV-4, or EIV on arrival, or 2-4 days later, and whether shedding was associated with identifiable risk factors. Real-time polymerase chain reaction assays were used to detect EHV-1, EHV-4, and EIV nucleic acid in nasal swabs obtained from 369 horses at the four events. In response to evidence of clinical disease, 82 additional horses were sampled at two farms providing horses for one of the sales. On arrival at the events, shedding of EHV-1 was detected in 3.3%, EHV-4 in 1.1%, and EIV in 0.8% of horses. EHV-1 was detected at low levels, and EHV-1 and EHV-4 detection was not associated with clinical disease. EIV was detected only in horses at a Thoroughbred sale, in association with an outbreak of respiratory disease traced back to regional farms. On arrival at events, horses younger than 2 years had a significantly greater risk of shedding EHV-1 compared with older horses; no other significant risk factors associated with viral shedding were identified. Thus, there is a risk of exposure to EIV, EHV-1, and EHV-4 at equine events, and horses and events should be managed to mitigate this risk.

1. Introduction

Respiratory disease is ranked highly as a common medical problem in horses [1], and viral infection is considered to be an important cause of outbreaks of contagious upper respiratory tract disease, particularly when horses congregate and mix at horse shows or sales events [2]. The most common causes of equine viral respiratory disease include equine influenza virus (EIV), equine herpesvirus-1 (EHV-1), and equine herpesvirus-4 (EHV-4). A 1998 surveillance study of infectious upper respiratory tract disease in Colorado found that EIV was the most common cause, followed by EHV-1 [2]. Outbreaks of

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infectious respiratory disease in horses in many other parts of the world have also been associated with EIV infection [3-8]. Several recent studies of equine respiratory disease have reported the detection of EHVs, including EHV-1, EHV-2, EHV-4, and EHV-5 [9-13]. However, reports of detection of EHV-1 in association with respiratory disease are comparatively rare, at least in the contemporary literature [14]. The role of EHV-1 is much more commonly reported in the context of outbreaks of neurological disease or abortion [15-17]. Equine rhinoviruses have also been reported to contribute to infectious respiratory disease in horses [3].

There have been few reports of surveillance for potential respiratory pathogens in healthy horse populations. Studies conducted in brood mare and foal populations in Australia demonstrated that EHV-1 and EHV-4 were commonly circulating in these populations, although infection was typically subclinical [18]. In contrast, another Australian study found infrequent evidence of EHV-1 and EHV-4 infection on breeding farms, whereas EHV-2 and EHV-5 were common isolates [19].

During the past decade, there has been a series of outbreaks of EHV myeloencephalopathy (EHM) caused by EHV-1 [15,16] that has heightened awareness of this condition. Research to determine the molecular characteristics of EHV associated with EHM outbreaks resulted in the identification of a point mutation in the DNA polymerase gene [20] that is associated with an increased risk for the development of EHM when horses are infected with this EHV-1 strain [17]. Because of the morbidity and mortality associated with EHM, as well as the financial losses owing to quarantine periods, there is considerable interest in the question of whether EHV-1 is commonly shed by horses, and particularly in association with the stress of transport or competition. In North America, two recent studies tested for EHV-1 shedding using real-time polymerase chain reaction (PCR) testing of nasal swab samples collected into viral transport medium (VTM) in large populations of horses exposed to stressors, including transportation stress [21] and abdominal disease [22]. Eight of 302 (2.6%) of horses exposed to transport stress were positive for EHV-1 shedding on real-time PCR (four horses) or had serological evidence of EHV-1 infection (four horses), although only one horse was affected clinically [21]. In 122 cases of severe abdominal disease, no EHV-1 shedding or viremia was detected using real-time PCR [22]. Overall, these different studies tend to challenge the assumption that EHV-1 commonly circulates subclinically, at least outside of breeding populations that include young foals.

The primary objective of this observational study was to identify nasal shedding of EIV, EHV-1, and EHV-4 in horses that have previously been characterized as having a high risk for transmission, specifically, horses that have been transported to major horse shows and sales in the United States. Our goal was to test three specific hypotheses. First, that young horses attending equine events will shed the contagious viral pathogens EIV, EHV-1, and EHV-4. Second, that shedding of these pathogens will be associated with risk factors that can be identified in individual horses. Third, that there is a difference between the prevalence of shedding at the time of entry to a competitive event and at 2-4 days after entry owing to the effects of transport and the mixing of animals. There is currently a limited amount of such surveillance data in North America; thus, information about the prevalence of nasal shedding in these horses, and any association with health, vaccination status, or management factors, will increase our understanding of the risks to horses attending equine events and enhance our ability to design risk mitigation and management strategies.

2. Materials and Methods

2.1. Animals

Sampling was targeted toward horses expected to be at greatest risk of infection and shedding, specifically juvenile animals up to 3 years of age that were arriving at equine events and sales. Horses younger than 1 year and older than 3 years were also included if present at the events. Horses were sampled once on the day of arrival at the event site to determine initial prevalence of infection. When possible, a second sample was collected 2-4 days after arrival, to detect differences in prevalence of shedding associated with commingling with other horses during transport or at the event itself, or as a result of the stress of transport to the event. Samples were collected from horses at four equine show events or sales: a sale held by Barrett's Equine Sales in March 2004 in Pomona, CA; the National Appaloosa Horse Show and World Championship Appaloosa Youth Show held in June 2004 in Oklahoma City, OK; the Fall Mixed Thoroughbred Sale held by the Ocala Breeders' Sales Company in October 2004 in Ocala, FL; and the American Quarter Horse Association (AQHA) World Championship Show held in November 2004 in Oklahoma City, OK. In response to evidence of clinical respiratory disease in horses at the Ocala Breeders' Company Fall Mixed Thoroughbred Sale, an additional 82 horses were sampled at two Florida farms that provided horses for this sale. In all instances, the organizers of these events or sales and the managers of the farms gave permission for the study to be conducted and assisted in informing owners of the nature of the study. The investigation was conducted with the support of local or show veterinarians, who assisted with introductions to owners and agents. Written consent for sampling was obtained from all horse owners or their agents before sampling. The study protocol was approved by the Institutional Animal Care and Use Committee at Colorado State University.

2.2. Risk Factor Questionnaires

Whenever possible, a questionnaire was completed by interviewing the owner or agent at the time of sample collection, or by telephone at a later date. The goal was to collect data that could be used to provide summary statistics for the sample population and to determine whether viral shedding was associated with risk factors. The data collected included horse-specific factors of age, sex, vaccination history, history of travel in the previous 6 months, history of disease in the previous 2 weeks, and home facility factors such as size of resident horse population, and whether the facility was "open" or "closed" (i.e., no entry of horses within the preceding 3 months).