The Occurrence of Equine Protozoal Myeloencephalitis (EPM) in the U.S. Horse Population: Results of a National Survey

Paul S. Morley, DVM, PhD, DACVIM; Josie L. Traub-Dargatz, DVM, MS, DACVIM; William J. A. Saville, DVM, PhD, DACVIM; Bruce A. Wagner, MS; Lindsey P. Garber, DVM, MS; Ann Hilberg-Seitzinger, PhD

This study provides the first national estimate of the incidence of Equine Protozoal Myeloencephalitis (EPM) diagnosis in horses, and frequency estimates for clinical signs, methods of diagnosis, and management of horses with EPM. While this disease does not occur with great frequency in the U.S. equine population, the consequences of disease are substantial and costly. Author’s Addresses: Department of Clinical Sciences, Colorado State University, Fort Collins, CO 80523 (Morley, Traub-Dargatz); Department of Veterinary Prevention Medicine, The Ohio State University, 1900 Coffey Road, Columbus, OH 43210-1092 (Saville); and Centers for Epidemiology and Animal Health, USDA:APHIS:Veterinary Services, 555 S. Howes Street, Fort Collins, CO 80521 (Wagner, Garber, Hilberg-Seitzinger). © 2000 AAEP.

1. Introduction

Equine protozoal myeloencephalitis (EPM) is a significant cause of neurologic disease among horses in the U.S.,¹ and this condition has received increasing attention throughout the equine industry, from veterinarians and owners alike. The causative agent of EPM is Sarcocystis neurona, a protozoan parasite that appears to have a predilection for the central nervous system of horses.¹ Unfortunately, very little is known about the incidence and factors affecting the occurrence of EPM.

The National Animal Health Monitoring System (NAHMS) Equine ‘98 Study, conducted by the U.S. Department of Agriculture: Animal and Plant Health Inspection Service: Veterinary Services (USDA:APHIS:VS), was designed to provide information on the nation’s equine population for education and research. Although the Centers for Epidemiology and Animal Health, a unit of the USDA:APHIS:VS, regularly conducts national health and management surveys in other animal agricultural industries, this was the first such study ever conducted of the equine industry. Study objectives were defined using a needs assessment process; one priority identified for the Equine ‘98 study was to gather information regarding the occurrence and epidemiology of EPM.² The purpose of this report is to describe the occurrence of EPM on horse operations throughout the U.S.
2. Materials and Methods

The Equine '98 Study was a cross-sectional study conducted using a stratified random sample of premises in 28 states. Information used to investigate the occurrence of EPM was collected by a field force including federal and state Veterinary Medical Officers and Animal Health Technicians between April 20 and June 12, 1998. Only operations with three or more horses were eligible to participate in this interview. The 1178 participating operations included in this study represented 51.6% of operations with horses and 83.9% of horses in the 28 states. A resident horse was defined as one that spent or was expected to spend more time at the operation than at any other operation; the operation was its home base.

Interviewers received training regarding proper uniform collection of data for this study, including specific training regarding collection of information pertaining to EPM. For the purposes of this study a horse was considered to have EPM if the operator believed the horse developed any problems that were attributable to this condition while it was a resident of the operation. Operators were asked to answer a series of questions regarding the occurrence of problems believed to be EPM on the operation during the previous year (March 1, 1997 through February 28, 1998), and at any time while this operation was in existence. Specifically, descriptive information was collected regarding horses developing EPM during the previous year, as well as for the last horse diagnosed with EPM on an operation regardless of the date of onset (“last cases”). The annual incidence of EPM was estimated using the number of reported new occurrences of EPM among resident horses during the previous year and the total number of resident horses that were 6 months old or older at the time of the second interview. Resident horses were assumed to be present on the operation during the entire previous year and were at risk of developing disease during all of that time. Operation characteristics identified during interviews were used to categorize operations for stratification of estimates describing the occurrence of EPM. Days of lost use were estimated based upon owners reports. For horses that died due to EPM, an average life span of 20 years was employed, and the horse’s age at death was subtracted from this average to obtain days of lost use due to EPM. Analyses were weighted to account for study design and complex sampling using specialized software.

3. Results

Overall, 59.8% (SEM = 2.9%) of owners/operators interviewed had never heard of Equine Protozoal Myeloencephalitis or EPM, and only 9.5% (SEM = 1.8%) considered themselves knowledgeable about this disease. There were not detectable differences in knowledge of operators in different regions (Fig. 1), but there were differences among operations with different numbers of resident horses (p < 0.001) and different primary uses of resident horses (p < 0.001).

Among EPM cases that were identified during the previous year, owners reported that 95.0% (SEM = 3.1%) were diagnosed by a veterinarian. This was similar across regions, size of operation, and primary use of resident horses. The average incidence of EPM estimated among horses 6 months of age or older was 14 new cases per 10,000 horses per year (SEM = 6 cases per 10,000 horses per year). Differences in the annual incidence of EPM were not detectable among operations from different regions (p = 0.53), or those with varying numbers of resident horses (p = 0.58), but there was a difference in the incidence of EPM among operations with different primary uses of resident horses (p = 0.04).

Overall, 1.0% (SEM = 0.5%) of operations reported that at least 1 resident horse developed EPM during the previous year, and 3.3% (SEM = 0.8%) of operations had at least 1 resident horse develop EPM at any time while the operation was in existence. An average of 1.7 EPM cases were recognized among operations where EPM had ever been recognized, while most (77%) had recognized only one case. Among all EPM cases reported to have occurred on operations, 19.2% (SEM = 7.8%) were reported to have occurred during the previous year although this varied among regions. Over half of the EPM cases described as the last case on a premise was reported to have occurred within 2 years of the interview (from 1996 to the time of the interview) and more than 94% were reported to have occurred since 1992. Onset of disease was most likely to have occurred in the summer or fall among EPM cases recognized during the previous year, as well as among last cases recognized on operations.

Operators reported methods that were used to establish a diagnosis of EPM in cases identified during the previous year. Evaluation of clinical signs was used most commonly (60.3% of cases, SEM = 22.8%), followed by use of serology (47.1%, SEM = 21.4%), cerebrospinal fluid (CSF) analysis (31.7%, SEM = 17.5%), and response to treatment (6.9%, SEM = 17.5%).
SEMs = $3.4\%$). These results were similar to those for methods reportedly used to diagnose EPM in the last case recognized on each premise. The most common clinical signs shown by EPM cases identified during the previous year as reported by operators were ataxia (90.8% of cases, SEM = $4.7\%$), limb weakness (86.0%, SEM = $6.8\%$), lameness (66.4%, SEM = $16.6\%$), muscle atrophy (42.5%, SEM = $20.1\%$), sore back (32.5%, SEM = $17.6\%$), behavior change (28.4%, SEM = $17.2\%$), and head tilt (23.0%, SEM = $14.6\%$). These categories were not mutually exclusive and a horse could have exhibited more than one sign. Among horses diagnosed with EPM during the previous year, 16.0% (SEM = $14.0\%$) received no treatment, 78.8% (SEM = $14.7\%$) reported received antimicrobials or parasiticide, and 69.2% (SEM = $16.2\%$) received a dietary supplement (e.g., vitamins) to treat the EPM. These treatment categories were not mutually exclusive and a horse could have exhibited more than one sign. Results were similar for treatments administered to the last EPM cases diagnosed on premises.

Among the last EPM cases recognized on operations from 1992 through 1996, operators reported that about half recovered completely, one quarter improved but did not recover completely, about 10% died or were euthanized because of EPM, and less than 1% improved or recovered but subsequently experienced a relapse or had no response after at least 3 months of apparent clinical disease. Interestingly, 15.0% (SEM = $9.8\%$) were reportedly sold or given away because of EPM. Results were very similar regarding all EPM cases that developed during the previous year.

Using information provided for the last EPM cases recognized on premises, the number of days of lost use attributable to EPM were estimated. For these EPM cases that completely recovered, relapsed following improvement, and those showing no improvement after at least 3 months duration, the average number of days of lost use was 244 days (SEM = $46\text{ days}$). For last EPM cases that died because of EPM, the estimated average number of days of lost use was 3345 days (9.2 yrs, SEM = $1.5\text{ yrs}$). Excluding cases that were less than 3 months in duration, the average cost to operations for diagnostic testing, veterinary care, and medications provided for the last case of EPM diagnosed was $790 (SEM = $245\text{.}$ However, estimates varied considerably among geographic regions (Fig. 1).

4. Discussion
This study provides the first national and regional estimates of the incidence of EPM, as well as descriptive information regarding the clinical signs, methods of diagnosis, and management of horses with EPM in the U.S. While this disease does not occur with great frequency in the U.S. equine population, the losses associated with EPM are substantial and costly.

The complex sample selection used in this study helps to assure that information obtained from the study is referable to the majority of the equine operations in the U.S. However, this same complex sample selection strongly influenced the ability to make precise estimates during this investigation as did the relative rarity of EPM. This can be seen in the large variance estimates that are common in the results. However, despite the fact that this would tend to make findings of this study more conservative, several large differences were identified regarding the occurrence EPM in different types of operations.

These results provide important information on the occurrence of EPM on operations in the U.S., and will likely serve as a foundation for future studies regarding the epidemiology and prevention of EPM.

References and Notes

* SUDAAN®, Software for the Statistical Analysis of Correlated Data, release 7.5, Research Triangle Institute, PO Box 121914, Research Triangle Park, NC 24409-2194.