

Investigation of the Potential Effects of Epizootic Hemorrhagic Disease Virus on Iowa Cattle

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Steven D. Sorden, assistant professor, VDPAM
 Perry A. Harms, adjunct instructor, VDPAM
 Nolan Hartwig, professor, VDPAM
 Kevin Petersburg, area veterinarian, USDA-APHIS
 Don J. Otto, veterinary medical officer, USDA-APHIS
 John Schiltz, State Veterinarian

Summary

Epizootic hemorrhagic disease virus (EHDV), an arthropod-borne orbivirus, causes significant mortality in white-tailed deer and can also cause disease in cattle. Objectives of this preliminary investigation were 1) to survey cattle at auction markets to determine the prevalence of anti-EHDV antibodies in Iowa cattle, 2) to determine EHDV seroprevalence in herds in which clinical EHD had been diagnosed, and 3) to determine whether EHDV is associated with stillbirths and/or congenital anomalies in calves. There was a 15% seroprevalence in auction market cattle; positive cattle were from southern, central, and western Iowa. Herds in which clinical EHD had been diagnosed had >60% seroprevalence. Viremia was detected in both clinically affected and unaffected cattle during an EHD outbreak. EHDV exposure was not consistently associated with congenital anomalies. Although additional surveillance is warranted, EHDV is unlikely to have a significant effect on the reproductive health of Iowa cattle.

Introduction

Epizootic hemorrhagic disease virus (EHDV), an arthropod-borne orbivirus, causes significant mortality in white-tailed deer and other cervidae. In 1998, there was a severe EHD outbreak in white-tailed deer in southern Iowa and Missouri, and cases of EHD were also diagnosed in cattle in the affected areas. Affected cattle usually exhibited salivation associated with oral ulcers, lameness associated with coronitis, and weight loss. Mortality was minimal.

EHDV is closely related to bluetongue virus, and both are transmitted by *Culicoides* sp. (midges). Since *in utero* bluetongue virus infection is known to induce congenital anomalies in ruminants, concern has arisen regarding the possible role of EHDV in causing congenital anomalies in cattle. The objectives of this investigation were 1) to survey cattle at auction markets to determine the prevalence of anti-EHDV antibodies in Iowa cattle, 2) to determine EHDV seroprevalence in herds in which clinical EHD had been diagnosed, and 3) to determine whether EHDV is associated with stillbirths and/or congenital anomalies in calves.

Materials and Methods

Veterinarians serving auction markets in different regions of Iowa were asked to submit a total of 30 randomly selected serum and whole blood samples from native Iowa adult cattle. No more than five animals were from the same herd, and no known infected herds were sampled. Agar gel immunodiffusion (AGID) assays to detect antibodies to EHDV were performed on each serum sample. PCR for EHDV DNA was performed on matching whole blood samples for selected AGID positive sera. AGID and PCR were performed at the National Veterinary Services Laboratory, Ames, Iowa.

In fall of 1999, AGID and PCR were performed on serum and whole blood from three herds that had experienced clinical EHD.

From fall 1999 through June of 2000, deformed calves and sera were submitted to the Veterinary Diagnostic Laboratory. Routine diagnostic investigations as well as EHDV AGID and PCR were performed.

Results and Discussion

Auction market survey:

Results are summarized in Table 1. Of the 166 cattle tested, 25 were AGID positive (15%). Positives were identified in southern, central, and western Iowa. Matching whole blood samples were available from 18/25 positives; all 18 were EHDV PCR negative, suggesting that most seropositive animals were not viremic.

Table 1. Auction market survey results by county.

| County | EHDV AGID positive cattle/ total cattle tested (% positive) | |
|---------------|--|-------|
| Bremer | 0/32 | (0%) |
| Carroll | 0/2 | (0%) |
| Clayton | 0/2 | (0%) |
| Crawford | 0/3 | (0%) |
| Decatur | 4/11 | (36%) |
| Delaware | 0/7 | (0%) |
| Dubuque | 0/22 | (0%) |
| Greene | 0/4 | (0%) |
| Harrison | 5/6 | (83%) |
| Jackson | 0/1 | (0%) |
| Jasper | 6/30 | (20%) |
| Monona | 3/9 | (33%) |
| O'Brien | 0/5 | (0%) |
| Plymouth | 5/23 | (22%) |
| Pottawattamie | 0/1 | (0%) |
| Sioux | 0/1 | (0%) |
| Woodbury | 3/7 | (43%) |

Survey of herds with a history of clinical EHD:

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Results are summarized in Table 2. In each of the three herds, >60% of the sampled cattle were EHDV AGID positive. In the Woodbury County herd, 83% of seropositive cattle were EHDV PCR positive (viremic), whereas none of the seropositive cattle were viremic in the Keokuk County herd. This discrepancy is explained by the fact that the Woodbury County herd was sampled during an outbreak of clinical EHD, whereas the Keokuk County herd was sampled 14 months following an October 1998 episode of EHD in which two 1.5-year-old heifers developed lameness. For the Woodbury County herd, six of six clinically affected cattle were AGID and PCR positive; six of 10 clinically unaffected cattle were AGID positive, and four of these six AGID positives were also PCR positive, consistent with the subclinical infections that have been induced by experimental inoculation studies.

Table 2. Survey of herds with a history of clinical EHD.

| Herd | AGID positive/ total tested | PCR positive/ AGID positive |
|-----------------|--------------------------------|--------------------------------|
| Dallas County | 14/20 (70%) | not done |
| Keokuk County | 7/11 (64%) | 0/7 (0%) |
| Woodbury County | 12/16 (75%) | 10/12 (83%) |

Calves with congenital anomalies:

1) Chondrodysplasia was diagnosed in two neonatal calves from an Audubon County herd that has had 14 deformed calves since 1994. Twelve sera from adult cows (including dams of both normal and abnormal calves) were all EHDV AGID negative, and matching whole blood samples were PCR negative.

2) Congenital anomalies were diagnosed in a calf from another Audubon County herd. Dam serum was EHDV AGID positive; matching whole blood for PCR was unavailable.

3) Tissues were received from a red Angus neonate from northern Missouri with multiple skeletal malformations. Dam serum was EHDV AGID negative.

Implications

Epizootic hemorrhagic disease virus is an occasional cause of clinical disease in cattle in southern, central, and western Iowa. Most infections are subclinical. Despite an estimated 15% seroprevalence, there is no evidence that EHDV is associated with reproductive failure in Iowa cattle. Although additional surveillance is warranted, EHDV is unlikely to have a significant effect on the reproductive health of Iowa cattle.

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