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PERSISTENT BOVINE VIRAL DIARRHEA VIRUS INFECTION IN U.S. BEEF HERDS

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Au cours de l'été 1996, nous avons réalisé un test de dépistage du virus de la maladie des muqueuses (MM) chez environ 19,000 veaux en provenance de 128 troupeaux de bovins allaitants situés dans 5 Etats des Etats Unis, à savoir l'Alabama, l'Ohio, le Nebraska, le Nevada et le Dakota du Nord. Des vétérinaires praticiens coopératifs ont été sélectionnés dans chaque Etat. Chaque vétérinaire a identifié 48 troupeaux clients de bovins allaitants dans lesquels était suspectée une infection par le virus de la MM en se basant sur l'historique de l'élevage et les signes cliniques observés. Ajoutés à cela, 80 élevages de bovins allaitants ont été sélectionnés à partir de la liste des clients des vétérinaires. Un échantillon de sérum a été collecté à partir de chaque veau avant l'âge de 4 mois dans chaque élevage et un isolement du virus de la MM a été tenté. Les données relatives à chaque troupeau, incluant les pratiques d'élevage, les pratiques de vaccination, les pertes par mortalité, et les performances de croissance des veaux ont été collectées par les vétérinaires au moyen de questionnaires standardisés. Nous avons identifié au total 56 veaux porteurs du virus de la MM dans 13 élevages. Au moins un élevage infecté par le virus de la MM (élevage positif) a été trouvé dans chaque Etat. Dix des élevages positifs étaient parmi les élevages suspects et 3 étaient parmi les autres élevages. Plus d'un veau infecté a été trouvé dans 11 des 13 élevages infectés. Un deuxième échantillon de sérum a été obtenu à l'âge de 6 mois sur 43 (77%) des 56 veaux initialement positifs. Trente trois (77%) de ces veaux étaient à nouveau identifiés comme infectés, confirmant ainsi leur statut d'infection persistante (IP). Onze des 13 veaux restants qui étaient infectés au moment du premier test étaient morts ou suspectés morts avant l'âge de 6 mois par le propriétaire. La mortalité des veaux est une des manifestations cliniques liées à l'IP par le virus de la MM, suggérant ainsi que 12 des 13 veaux étaient aussi IP. Un échantillon de sérum a été collecté à partir des mères de 45 veaux infectés. Trois mères (7%) dans deux élevages ont été trouvées porteuses du virus de la MM. Ces données suggèrent que les veaux infectés de façon permanente par le virus de la MM peuvent être un moyen important de persistance de l'infection dans les troupeaux de bovins laitiers.

INTRODUCTION

Bovine viral diarrhea virus (BVDV) infection can produce a variety of economically important clinical manifestations in beef herds. Cattle persistently infected (PI) with BVDV shed large amounts of virus, and may be an important means by which infection is maintained within a herd. Vaccines against BVDV have been used extensively in preventive programs in beef breeding herds and in feedlots, but persistently infected animals continue to be identified (Bolin et al., 1985; Holland et al., 1993; Taylor et al., 1997a). However, prevalence rates of PI animals and the effects on herd productivity have not been reported. In addition, herd-level risk factors that might predispose herds to persistent infections have not been reported. The objectives of the study were to estimate the prevalence of beef herds with persistent BVDV infection, to identify herd-level risk factors for persistent BVDV infection in beef herds, to quantify the effects of persistent BVDV infection on herd measures of health and production, and to describe the disposition of calves with naturally occurring persistent BVDV infections in U.S. beef herds.

METHODS

Study Population

We initially identified veterinarians in five geographically diverse states that routinely provided veterinary services to commercial beef herds. Forty-eight cooperating veterinary practices were identified in the states of Alabama, Nebraska, Nevada, North Dakota, and Ohio. Each of the cooperating veterinarians served as a sampling cluster for the selection of 2-5 participating beef herds. Herds were randomly selected from a list frame of all beef herds that routinely received service from each cooperating veterinarian. Herds were selected from the list frame using a random numbers table.

Selected herds were contacted by the veterinarian and asked about participation in the study. Interested producers were then screened using the following criteria :

1. The herd had a minimum of 20 breeding females.
2. The herd used a limited breeding season and spring calving.

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3. The herd is willing and able to provide required information for the study.
4. The herd is willing to allow sampling of animals as required for the study.

Randomly selected herds which met this criteria were enrolled in the study as participating herds.

In addition to randomly selected herds, the cooperating veterinarians were asked to identify client beef herds in which they suspected BVDV infection was present based on history and observed clinical signs. Herds which meet this criteria were screened using the above criteria and enrolled in the study as participating herds. When serum samples were collected, veterinarians also collected information concerning management practices and calving season information. Further information was collected by the veterinarians at weaning regarding production.

Sera from all calves were tested for the presence of BVD viral antigen using the microtiter immunoperoxidase plate assay (Afshar et al., 1991). A second serum sample was obtained from calves that were positive to the initial screening, and from the dams of calves positive to the initial screening.

RESULTS AND DISCUSSION

A total of 19,636 calves in 133 beef herds were sampled in the spring and summer of 1996. Sera from five of the herds were not usable, leaving 18,931 from 128 herds as the study population. Of these herds, 80 were randomly selected herds and 48 were herds in which the veterinarians suspected BVDV infection. We identified a total of 56 BVDV positive calves in 13 herds. At least one herd with BVDV positive calves was identified in each of the five states. Ten (21%) of the suspect herds, and three (4%) of the randomly selected herds were found to have BVDV positive calves. Multiple BVDV positive calves were identified in 11 (85%) of the 13 herds with positive calves. A second serum sample was obtained at approximately 6 months of age from 43 (77%) of the 56 initially positive calves. Thirty-three (77%) of the second samples were BVDV positive, confirming persistent infection (PI) status. Eleven of the remaining 13 calves that were positive at initial screening were either known or presumed to be dead by the owners before 6 months of age. One of the remaining calves could not be identified and was lost to follow-up. The final calf was considered a Apoor doer@ and had been sold prior to the retest because of poor growth. Calf mortality and poor growth performance are manifestations of persistent BVDV infection (Taylor et al., 1997), suggesting that 12 of the calves without a second test were also PI. A serum sample was obtained from the dam of 45 of the positive calves. Three of these dams (6.7%) on two farms were found to be BVDV positive.

These data suggest that persistently infected BVDV calves can be an important means of maintaining BVDV infection in beef herds. Most of the calves we identified as BVDV positive at the initial screening survived to weaning, and could provide a constant source of virus to the herd throughout the breeding season. This situation could potentially result in PI calves born in a herd each year without appropriate intervention. Our data also suggest that PI females returning to the breeding herd are not an important means of maintaining BVDV infection.

Table I
Frequency and prevalence rates of beef herds identified with calves persistently infected with bovine viral diarrhea virus in five U.S. states.

	Average calves per herd	Total herds tested		Herds with PI calves		Prevalence	
		R	S	R	S	R	S
Alabama	31	13	2	0	1	0	50%
Nebraska	171	32	22	2	4	6%	18%
Nevada	259	10	7	1	2	10%	29%
North Dakota	158	13	13	0	2	0	15%
Ohio	54	12	4	0	1	0	25%
Total	148	80	48	3	10	4%	21%

R = Randomly selected herd, S = Suspected BVDV infected herd

Table II
Outcomes of 56 BVDV infected calves identified in 13 beef herds located in 5 US states in 1996.

Classification	Number of calves	Percentage
Calves positive to initial screening	56	
Lost to follow-up	1	
Calves with follow-up information	55	
Survived to weaning Negative on retest	10	18%
Survived to weaning Positive on retest	33	60%
Died or presumed dead prior to weaning	11	20%
Sold for poor growth prior to retest	1	2%

One positive calf at the initial screening was not adequately identified, and was lost to follow-up.

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