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Mature open cows are rarely persistently infected with bovine viral diarrhea virus

Abstract

Bovine viral diarrhea virus (BVDv) is an immunosuppressive virus affecting cattle in a multitude of ways. The varied presentation makes this disease difficult to identify in cow herds and the signs of a BVD infection may be very subtle. The syndrome causes economic problems by reducing herd fertility and increasing disease rates. The persistently infected (PI) animal is a unique reservoir for BVDv. These cattle are the result of in utero exposure to the noncytopathic biotype of BVDv prior to the development of a competent fetal immune system at about 125 days of gestation. Persistently infected animals are the primary method for the disease to propagate over time. PI cattle consistently shed BVD virus in relatively high levels and this exposure to the breeding herd can result in new PI calves. PI animals propagate BVDv in the herd and decrease pregnancy percentages compared to herds without PI animals. Farms must assess risk and manage for biosecurity when purchasing adult animals with an unknown history of disease exposure. Breeding herds that introduce new animals to the herd face the risk of importing a BVD PI animal. To mitigate this risk, PI animals must be accurately identified prior to herd introduction, but visual appraisal is not an accurate method of discovering these animals. Multiple diagnostic tests are available to determine the BVD status of incoming animals and all have an associated cost. Economic feasibility of determining the BVD PI status of animals depends to a large degree on the frequency with which PI animals occur in a population. Previous research has illustrated that PI calves entering the feedyard phase of production are fairly rare (about three per 1,000 calves); however, very little work has been done in mature animals. This project provides an estimate of BVD PI frequency for a specific population. This assessment should allow the formulation of a BVD-specific risk management plan which addresses the economic efficiency of testing mature females upon arrival. The primary objective of this research is to determine the prevalence of BVD PI animals in a population of young (3- to 6-year-old) cows purchased as non-pregnant mature animals. The results can guide biosecurity decisions for producers when purchasing and introducing this class of animal to the herd.

Keywords

Cattlemen's Day, 2007; Kansas Agricultural Experiment Station contribution; no. 07-179-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 978; Beef; Cattle; Bovine viral diarrhea virus (BVDv); persistently infected (PI)

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MATURE OPEN COWS ARE RARELY PERSISTENTLY INFECTED WITH BOVINE VIRAL DIARRHEA VIRUS

B. J. White¹, R. L. Larson¹, D. U. Thomson¹

Introduction

Bovine viral diarrhea virus (BVDv) is an immunosuppressive virus affecting cattle in a multitude of ways. The varied presentation makes this disease difficult to identify in cow herds and the signs of a BVD infection may be very subtle. The syndrome causes economic problems by reducing herd fertility and increasing disease rates.

The persistently infected (PI) animal is a unique reservoir for BVDv. These cattle are the result of *in utero* exposure to the noncytopathic biotype of BVDv prior to the development of a competent fetal immune system at about 125 days of gestation. Persistently infected animals are the primary method for the disease to propagate over time. PI cattle consistently shed BVD virus in relatively high levels and this exposure to the breeding herd can result in new PI calves. PI animals propagate BVDv in the herd and decrease pregnancy percentages compared to herds without PI animals.

Farms must assess risk and manage for biosecurity when purchasing adult animals with an unknown history of disease exposure. Breeding herds that introduce new animals to the herd face the risk of importing a BVD PI

animal. To mitigate this risk, PI animals must be accurately identified prior to herd introduction, but visual appraisal is not an accurate method of discovering these animals. Multiple diagnostic tests are available to determine the BVD status of incoming animals and all have an associated cost.

Economic feasibility of determining the BVD PI status of animals depends to a large degree on the frequency with which PI animals occur in a population. Previous research has illustrated that PI calves entering the feedyard phase of production are fairly rare (about three per 1,000 calves); however, very little work has been done in mature animals. This project provides an estimate of BVD PI frequency for a specific population. This assessment should allow the formulation of a BVD-specific risk management plan which addresses the economic efficiency of testing mature females upon arrival.

The primary objective of this research is to determine the prevalence of BVD PI animals in a population of young (3- to 6-year-old) cows purchased as non-pregnant mature animals. The results can guide biosecurity decisions for producers when purchasing and introducing this class of animal to the herd.

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Experimental Procedures

Individual ear skin samples were collected from 1,509 open cows on arrival at a facility near Manhattan, KS, between November 2005 and June 2006. The cows were mixed breeds and were assembled by multiple-order buyers in western states. Samples were submitted to the Kansas State University Veterinary Diagnostic lab for analysis with an antigen capture ELISA test. Prevalence was determined by calculating the proportion of positive samples in the population tested.

The official calfhood vaccination (OCV) tattoo on each animal was examined and the year the animal was vaccinated was recorded. According to federal law, animals must be vaccinated between 6 and 12 months of age; thus, the year of vaccination serves as a proxy for estimating animal age.

Results and Discussion

Examination of tattoos revealed age information on 63.4% (956) of the animals. Most of the cattle in the survey population were young to early middle-aged (vaccinated in 2000 or later; Table 1.). The cattle were purchased as non-pregnant females and pregnancy status may have played a role in their removal from the herd of origin. The population tested represents mature animals that were removed from production systems for a variety of reasons and sold. The demographics are very similar to animals that a herd owner would encounter when buying mature replacement animals for the breeding operation.

Antigen capture ELISA test results were negative on all 1,509 animals. This test does not evaluate animals for acute infections, but rather should only identify persistently infected animals. In this population, there were no persistently infected animals.

Table 1: Number of Cows by Year of Brucellosis Vaccination

Year of OCV Vaccination	Number of cows	% of Group:
Unknown	553	36.6%
1996	1	0.1%
1997	10	0.7%
1998	16	1.1%
1999	31	2.1%
2000	108	7.2%
2001	124	8.2%
2002	218	14.4%
2003	337	22.3%
2004	107	7.1%
2005	4	0.3%
Total:	1509	

Biosecurity to prevent herd exposure to PI cattle is important. Individual testing of all animals that arrive on a farm provides the highest level of security, but is often economically infeasible. Resources should be allocated to areas presenting the highest risk of disease entry. This project indicates that mature, open animals are at relatively low risk for being a persistent carrier of the virus. The tests did not look for acute (or transient) BVDv infections; however, the risk of transfer of virus to the herd of origin from an actively infected animal can be effectively mitigated by keeping the new arrivals segregated for 30 days. Therefore, testing and biosecurity efforts should be placed in other areas known to contribute to formation or introduction of BVDv PI animals.

All replacement heifers and bulls that enter the breeding herd, whether raised or purchased, should be tested and confirmed as PI-negative prior to the start of breeding. If a pregnant animal is purchased, it should be segregated from the breeding herd until both the dam and the calf are confirmed to be PI-negative. Although the dam is unlikely to be persistently infected, current testing methods can not determine the status of the fetus until

it is born. These new calves should be tested after birth and prior to introduction to the breeding herd. Fence-line contact with neighboring cattle should be managed so that stocker cattle are not adjacent to the breeding herd during early gestation (< 130 days), and other cowherds are not adjacent unless they also have a strict biosecurity and vaccination program in place.

Implications

Based on this research, importing mature open animals poses a very low risk for introducing a persistently infected animal; although still a potential risk, younger animals and the fetuses/calves carried by pregnant cows of any age are considered a much greater risk for introducing BVD to a herd.