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Characterizing Overall Response to Two-shot Vaccination for BVDV Type 2 in Angus Weanling Calves

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Characterizing Overall Response to Two-shot Vaccination for BVDV Type 2 in Angus Weanling Calves

Abstract

Vaccination is a management strategy utilized to help reduce prevalence of bovine respiratory disease in feedlots. However, not all animals respond similarly to vaccinations. It is believed that an animal's genetics control part of the ability to respond to a vaccination protocol. In order to evaluate the genetic control of a new trait such as response to vaccination, it is important to understand the non-genetic factors that affect an animal's response to vaccination. The objective of this study was to characterize the non-genetic factors affecting overall response to a two-shot vaccination for bovine viral diarrhea virus type 2 (BVDV2) in Angus weanling calves.

Keywords

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Introduction

Vaccination is a management strategy utilized to help reduce prevalence of bovine respiratory disease in feedlots. However, not all animals respond similarly to vaccinations. It is believed that an animal's genetics control part of the ability to respond to a vaccination protocol. In order to evaluate the genetic control of a new trait such as response to vaccination, it is important to understand the non-genetic factors that affect an animal's response to vaccination. The objective of this study was to characterize the non-genetic factors affecting overall response to a two-shot vaccination for bovine viral diarrhea virus type 2 (BVDV2) in Angus weanling calves.

Materials and Methods

This study utilized 1,004 calves born in spring and fall seasons of 2007, 2008, and 2009 (six year-seasons) in the Angus selection project at the ISU McNay Research Farm. All calves were given two vaccinations of a 5-way (BVDV1, BVDV2, BRSV, IBR, PI-3) modified live vaccine approximately three weeks apart near weaning with half the calves ($n = 508$) weaned at initial vaccination and half the calves ($n = 496$) weaned at booster vaccination.

Overall response was calculated as the difference between three weeks post-booster

vaccination titer level and initial vaccination titer level. The following potential effects were tested for their association with overall response to BVDV2 vaccination:

- Year-season
- Sex of calf
- Wean stress timing
- Pinkeye incidence status at weaning
- Dam age
- Linear effect of BVDV2 titer at initial vaccination
- Quadratic effect of BVDV2 titer at initial vaccination
- Linear effect of calf age at initial vaccination nested within year-season
- Quadratic effect of calf age at initial vaccination nested within year-season
- Average daily gain of the calf during the response period

Results and Discussion

Table 1 shows that overall response to BVDV2 vaccination was significantly ($P < 0.05$) affected by: wean stress timing within the vaccination protocol, pinkeye incidence status at weaning, dam age, quadratic effect of BVDV2 titer at initial vaccination, and age of calf nested within year-season. Calves that were weaned at initial vaccination had a higher overall response than calves that were weaned at booster vaccination. Calves that were not affected with pinkeye also had a higher overall response to vaccination than calves that had a pinkeye infection at weaning. The quadratic effect of BVDV2 titer at initial vaccination on overall response is presented in Figure 1. Calves with low titers at initial vaccination had positive overall response, however as titer increased the overall response declined until the initial titer level reached about eight, then

the overall response leveled off. Calf age showed variable effects on overall response depending on the year-season of the calf. In some year-seasons, the overall response increased as calf age increased, although in some year-seasons the overall response decreased as calf age increased.

Factors that did not affect overall response were: year-season, sex of calf, and average daily gain. Likely, the year-season effect was picked up as part of the calf age nested within year-season effect since the effect of age was so variable across year-season groups.

Overall response to a two shot vaccination program is a complex trait that is influenced by several factors. Understanding how these factors influence response to vaccination will help to characterize the genetic control of response to vaccination.

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Table 1. Significance of non-genetic factors affecting overall response to BVDV2 two-shot vaccination in calves at the ISU McNay Farm, Chariton, IA.

Non-genetic effect	Overall titer response to BVDV2 (P-value)
Year-season	... ^a
Sex of calf	...
Wean stress timing	0.0078
Pinkeye incidence status at weaning	0.0360
Dam age	0.0002
Linear effect of BVDV2 titer at initial vaccination	*
Quadratic effect of BVDV2 titer at initial vaccination	< 0.0001
Linear effect of calf age at initial vaccination nested with year-season	< 0.0001
Quadratic effect of calf age at initial vaccination nested within year-season	...
Average daily gain of the calf during the response period	...

^a... = P-value > 0.05.

*Linear effect is automatically included when the quadratic effect is significant.

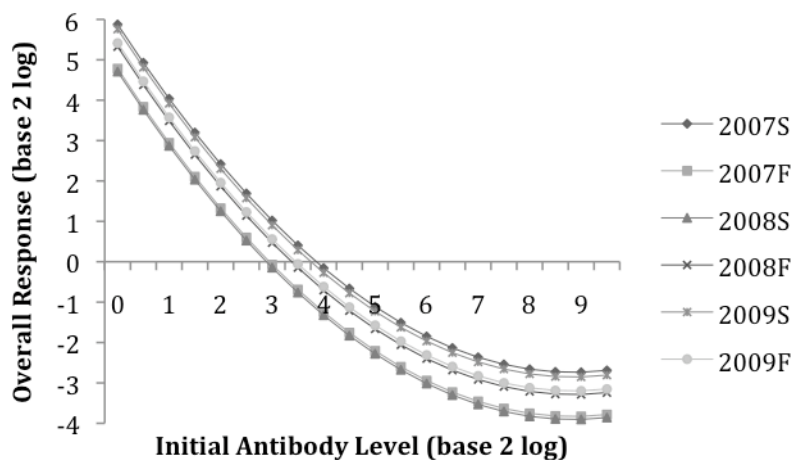


Figure 1. Plot of expected overall response to BVDV2 related to initial antibody level for BVDV2 across the six year-season groups at the ISU McNay Farm, Chariton, IA. Plots are shown assuming: dam age of 5 years, calf age at initial vaccination of 133 days, weaned at initial vaccination, and no pinkeye present at weaning.