Descriptive epidemiology of bovine leukemia virus among herds enrolled in a national study of the impacts of infection on dairy cow longevity and production

R.M. LaDronka, *MPH, DVM*[1]; **B. Norby**, *DVM, PhD*[2]; **T.M. Byrem**, *PhD*[3]; **R.J. Erskine**, *DVM, PhD*[2]; **D.L. Grooms**, *DVM, PhD*[2]; **P.C. Bartlett**, *MPH, DVM, PhD*[2]

[1]*Comparative Medicine and Integrative Biology Program, Michigan State University, College of Veterinary Medicine, East Lansing, MI 48824*

[2]*Large Animal Clinical Sciences, Michigan State University, College of Veterinary Medicine, East Lansing, MI 48824*

[3]*Antel BioSystems, Lansing, MI 48910*

Introduction

Bovine leukemia virus (BLV) is a deltaretrovirus prevalent in approximately 80% of US dairy herds and 30% of US dairy cattle[1]. Previous work by our research group and others has shown that BLV infection leads to decreased milk production, impaired immune response, and decreased longevity among positive dairy cattle[1]. Much of this work was part of a 2010 study of 113 Michigan dairy herds[2]. Our research group is currently undertaking a nationwide study of bovine leukemia virus, in which we will be enrolling 120 herds from 11 states. The objective of this study is to confirm our findings from Michigan on a broader national scope. The descriptive epidemiology of bovine leukemia virus among herds enrolled in this study are presented here.

Materials and Methods

As of May 2015, 10 herds each were enrolled from Michigan, Minnesota, New York, Pennsylvania, and Wisconsin. Herds were contacted and enrolled via their DHIAs. Large (>2000 head), medium (200 to 1999 head), and small (70 to 199 head) herds were targeted for enrollment, such that the size of herd enrolled in a state were reflective of the size of herds in the state overall according to National Agriculture Statistics Service 2012 Agricultural Census data. Forty milk samples from each herd were tested for BLV by milk ELISA, and BLV herd profile (BHP) was calculated for each herd as previously described[2].

Results

The mean BHP for herds enrolled as of May 2015 was 41.6% (range: 0.0 to 93.6%). One way ANOVA showed that the differences in average BHP among states were non-significant (p=0.22). The state average BHP ranged from 32.6% to 56.2%. The association between mean BHP and herd size category approached significance (p=0.052) with a trend toward larger herds having higher BHPs. The mean BHP for large herds was 57.9% (range: 37.5 to 93.4%), for medium herds was 37.0% (range: 15.0 to 67.5%), and for small herds was 36.7% (range: 0.0 to 85.0%). Linear regression modeling BHP on herd size (as a continuous rather than categorical variable) was significant (p=0.0067), however it did a poor job of prediction for small herds and had an adjusted R-square of only 0.1278. Removing small herds (70 to 199 head) from the analysis resulted in a better fitting model with an adjusted R-square of 0.4126 (p=0.0002).

The overall mean BHP of 41.6% is consistent with our group's findings in Michigan and previous national surveys[1]. There was no significant evidence of variation in BHP between states; however, as more herds in more states are enrolled in the study (especially those from Southern states, which have previously been noted to have higher prevalence of BLV) this may become significant. Previous studies have also consistently found an association between herd size and within-herd BLV prevalence. Among the herds enrolled in this study as of May 2015, this association is present as well; however, the association is stronger when herds smaller than 200 head are excluded. This is due to the wide range of BHP for herds in the small size category. Five of the 23 herds in this category had BHPs of 0% - i.e. there were no positive cows found among those sampled. On the other hand, 7 of the 10 highest BHPs were reported in this size category.

Significance

Management practices common to smaller herds may result in this apparent contradiction. These associations will be evaluated further in latter portions of this study.

References

1. Bartlett PC, Sordillo LM, Byrem TM, Norby B, Grooms DL, Swenson CL, Zalucha J, Erskine RJ. Options for the control of bovine leukemia virus in dairy cattle. *Am Vet Med Assoc* 2014; 244:914-922.

2. Erskine RJ, Bartlett PC, Byrem TM, Render CL, Febvay C, Houseman JT. Using a herd profile to determine age-specific prevalence of bovine leukemia in Michigan dairy herds. *Vet Med Intl* 2012; Article ID 350374, 1-5.