

Bovine Leukemia Virus

Background and Summary of the 2010-2012 Michigan Study

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Bovine leukosis is a contagious disease of cattle caused by Bovine Leukemia Virus (BLV). The disease is characterized by a persistent leukemia, which can culminate in malignant lymphosarcoma [8]. The National Animal Health Monitoring System (NAHMS) determined that BLV is present in 89% of US dairy operations [9]. Only 30 to 40% of BLV carriers will develop leukemia, while less than 5% develop malignant lymphosarcoma [8]. A later study determined the incidence of lymphosarcoma was 6 to 7 cases/yr/1,000 cows if the herd prevalence of BLV was 50% [7]. Because BLV seldom causes outward clinical signs of leukemia, the effects of BLV infection on overall bovine health and productivity are believed to be relatively minor when only malignant lymphosarcoma is considered, although this depends on the proportion of cows infected in a herd. When lymphosarcoma develops, the clinical signs are largely a function of the organs that are invaded by the malignant cells, often the spinal column, uterus, heart, and abomasum.

However, the possibility that the disease can cause less obvious changes in dairy cattle productivity is controversial. Early studies found no influence on milk production, incidence of mastitis, or reproductive performance [3]. In contrast, other studies reported negative effects of BLV infection on reproductive performance, milk production, and in particular, longevity [2, 4, 5, 6]. It is probable that the negative effects of BLV on milk production and reproduction are reduced by early culling of poor-performing infected cows, and therefore the major effect of BLV in many herds may be primarily realized by reduced cow longevity. As part of the USDA-NAHMS 1996 dairy study, the estimated average reduction in productivity was approximately \$59/cow for BLV test-positive herds [6]. A Virginia study suggested a loss of over \$400/case of lymphosarcoma; however, subclinical cost was \$64/cow per year in herds with a BLV prevalence of 50% [7].

To further our understanding of this disease, we surveyed 113 Michigan dairy herds in the summer of

2010 to determine what herd management practices may be associated with herd prevalence of BLV infection. The results are described below, and suggest the herd risk factors for infection are complex.

Michigan Field Study

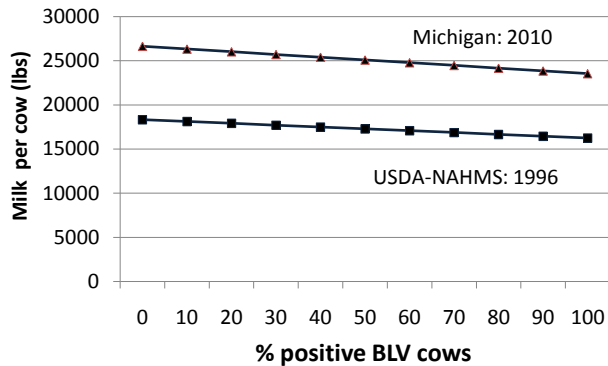
We randomly selected 113 dairy herds in Michigan that participated in regular DHIA testing, had at least 120 cows on test and, that were willing to participate. Herds were visited once during the summer of 2010 to complete a survey regarding facilities, history, and management practices. Additionally, DHI technicians collected milk samples during one routine test day for submission to the laboratory (AntelBio) for ELISA testing of BLV antibodies. We designed a herd profile as a practical method to estimate the herd prevalence of BLV- infected cows and the relationship of age to infection.

For the profile, we collected 40 milk samples per herd on the study; 10 samples each from first, second, third, and fourth or greater lactation cows. We also selected cows that recently calved, based on calving dates recorded from the previous month test date. To validate the BLV herd profile, we compared BLV milk ELISA with serum ELISA in 142 cows, and compared our profile sample size with whole herd milk ELISA in four herds. We determined that there was a 95% agreement between BLV milk and serum ELISA. Finally, with profile testing, we estimated herd prevalence of BLV-infected cows consistent with that obtained from whole herd testing.

The percentage of BLV-infected cows in herds ranged from 0% to 76%. The prevalence of infection in first-lactation cows (18%) was less than third-lactation and greater cows (42%). This may reflect the slow progression of the disease and/or exposure to transmission risks, e.g., through more frequent injections of adult cattle vs. heifers. Higher risk of BLV infection also was associated with larger herds, especially those that added replacement animals in the last 3 years.

We determined that higher prevalence of BLV infection in herds was associated with lower milk production per cow (annual rolling herd average basis), which agrees with previous research. Herds with higher prevalence of BLV infection had significantly lower proportions of older cows (third lactation or greater), which suggests that increased prevalence of BLV infection is associated with decreased longevity.

Figure 1 - Association between herd BLV prevalence and milk per cow per year

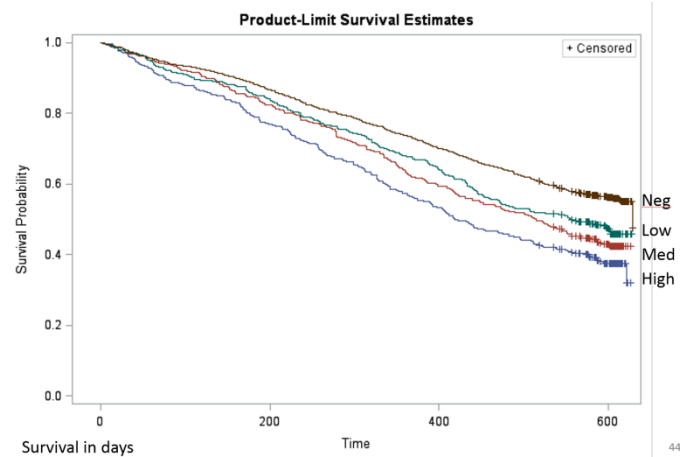


Risk factors associated with the transmission of BLV are related to exposure of blood from infected animals. Thus, shared needles, palpation, tattoo pliers, dehorning, and to a lesser extent, nasal discharges, colostrum, and flies, all have been incriminated as sources of infection. Analysis of our survey data determined that natural service breeding of heifers, reuse of needles, gauge dehorning, increased numbers of reproductive exams, and lack of fly control were significantly associated with increased prevalence of BLV infection at the herd level. This suggests that the control of this disease is complex, and will result from multiple management practices that are part of a comprehensive herd plan.

Follow-up to the Michigan Study

Following initial BLV testing the records of each of the 40 tested cows in each herd were electronically followed over the next 2 years and milk production and culling were monitored. Over the follow-up period, BLV-positive cows were 23% more likely than their negative herd mates to die or be culled. Further, when BLV test result was examined as high positive, moderate positive, low positive, and negative (as opposed to simply positive and negative), high positive cows were 40% more likely than their negative herd mates to die or be culled over the follow-up period [1].

Figure 2 - Survival of cows over time by BLV test result



For these same cows, the effect of BLV on 305ME milk production was examined. Positive cows produced 1% less milk than negative cows; and similar to longevity, the effect was stronger in the high positive group, who produced 3% less milk [unpublished]. These findings support the herd-level evidence from the earlier part of the Michigan study, that BLV infection is significantly associated with decreased cow longevity and decreased milk production.

Summary

Bovine leukosis is a disease that progresses slowly, and is often subclinical in presentation. Only a small percentage of cows infected with BLV develop lymphosarcoma. Milk production and longevity have been cited as potential losses from BLV infection. Our study supports this concept. Older cows and herds that have added replacement animals are at a higher risk of infection. Identifying single herd management practices that are associated with decreased risk of infection is difficult, and eventual control of this disease within a herd likely will be accomplished from a comprehensive plan of testing and management.

References

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