Bulls as a source of bovine leukemia virus during natural breeding

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Introduction

Bovine leukosis is a chronic lymphoproliferative disorder in cattle caused by the deltaretrovirus, bovine leukemia virus (BLV). Most BLV infected animals remain asymptomatic and act as carriers of the virus; 30 to 40% of infected cattle develop a persistent lymphocytosis, while less than 5% progress to lymphosarcoma. The major route of virus transmission is believed to be iatrogenic through procedures that permit the transfer of blood between cattle. Proviral DNA has been identified in nasal secretions, saliva, semen, and smegma. Natural transmission through these secretions has not been clearly demonstrated. Our research group has identified the use of bulls in dairy herds as a risk factor for BLV infection at the herd level, and has also shown a high prevalence (45%) of infected beef bulls in Michigan. Natural service is still used in half of dairy operations across the US, and is the most commonly used breeding method (approximately 90%) in beef cattle herds in the US. Given these factors, there may be risk of BLV transmission during natural breeding via smegma or blood transfer following trauma to the penis, vulva, and vagina. The overall goal of our research team is to develop cost effective strategies to reduce the transmission of BLV in cattle herds. The objective of this study is to assess the risk of BLV transmission by breeding bulls during natural breeding.

Materials and Methods

Forty (40) 12-month-old Angus crossbred heifers were selected. To be eligible, the heifers needed to be clinically healthy, seronegative for BLV by antibody detection ELISA, negative for BLV provirus by CoCoMo-qPCR, and determined to be cycling and not pregnant. Two bulls were acquired for this study. One was BLV seronegative and PCR negative for BLV in blood and smegma. The second bull was BLV seropositive and PCR positive for BLV in blood and smegma. Heifers were randomly assigned to 1 of 2 groups: control (n=20) heifers exposed to a BLV negative bull and treatment (n=20) heifers exposed to a BLV positive bull. All heifers were given 25mg of dinoprost tromethamine at the beginning of the trial. On day 0 of the study, bulls were introduced into their respective breeding group for a period of 38 days. The treatment and control groups were housed separately with no fence-line contact within 1000 meters. Serum and whole blood were collected from all heifers at days -60, -30, and 0 days prior to introduction of bulls and 30, 60, and 90 days after bulls were removed. Serum, whole blood, semen and smegma were collected from bulls on days 0 and 38. Significant differences in the incidence of seroconversion and detection of BLV provirus were determined by the Chi-Square test.

Results

In the BLV exposed group, estrus activity was observed in 100% of the heifers and 85% (17/20) were confirmed pregnant. Within the pregnant heifers, 17 heifers, 70.5% (n=12/17) became pregnant in the first week. In the control group, estrus activity was observed in 90% (18/20) and 65% (n=13/20) were confirmed pregnant. Within the pregnant heifers, 84.6% (n=11/13) became pregnant in the first week. No evidence of BLV infection was detected in the BLV negative bull at any time point. BLV provirus was detected in whole blood and smegma but not semen at all time points in the BLV positive bull. Seroconversion to BLV or BLV provirus was not detected in any of the heifers from either of the 2 groups at any time point.

Significance

Controlling BLV in cattle herds requires putting in place strategies to reduce the risk of BLV transmission. The results of this study suggest that BLV infected bulls that are healthy and aleukemic may not be a significant risk of BLV transmission during a defined breeding season. Regardless, veterinarians and producers should be aware that risk of transmission will likely increase as the length of exposure increases and if bulls progress to develop persistent lymphocytosis with higher BLV proviral loads.