

Impact of milk feeding levels and housing on the incidence of respiratory disease in young dairy calves

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Introduction

Bovine respiratory disease (BRD) continues to be the leading cause of death in feeder cattle, with losses approaching \$1 billion annually in North America. In contrast to beef cattle, dairy calves are more likely to be affected with BRD during the pre-weaning (incidence, 58%) and post-weaning (incidence 42%) periods. Additionally, the impact of BRD extends beyond the actual disease episode, with negative effects evident on subsequent productivity and survivability of replacement stock. The ability to identify calves during the initial stages of BRD by behavior monitoring would allow for earlier treatment intervention and potentially decrease the disease's effects on subsequent productivity. Results of recent studies indicate that group housing or daily increased provision of milk decreased the incidence of disease and increased the daily gain. These findings suggest the potential for a positive effect of the social interactions stemming from group or paired housing. The objective of this study was to determine the effects of milk feeding levels and housing on the incidence of BRD in young dairy heifers.

Materials and Methods

Two hundred-fifteen female Holstein calves from a commercial dairy farm were randomly assigned to one of 3 treatment groups (calves individually housed in a hutch and fed a standard amount of milk [4 L/day; control group], calves individually housed in a hutch and fed a high amount of milk [8 L/day; high group], or calves housed in hutches in pairs and fed a standard amount of milk [paired group]) in a randomized block design. Social interaction, activity levels and feeding behavior were measured by fitting calves with an animal activity-monitoring collar developed at the University of Tennessee. Calves were weighed at study enrollment and weaning. Data were analyzed to identify changes in social interaction or feeding behavior associated with the development of BRD. Blood samples were collected for

determination of serum IgG concentration (ie, determination of passive transfer status) at 48 hours after birth and at monthly intervals for the duration of the study for determination of serum antibody titers against various BRD pathogens. To monitor extent of seroconversion to various pathogens associated with BRD, paired serum samples were collected from any calf with BRD and a healthy cohort.

Results

The automated sensor system successfully recorded activity levels of calves in the 3 treatment groups. Total activity levels were correlated with milk consumption, with a substantial increase in calf activity preceding feeding. We also identified a unique time-series signature from the acceleration data (activity levels) that corresponds with normal specific behaviors such as sleeping, standing, walking, and bottle feeding, and we used these data to identify deviations from normal behavior. Unfortunately, to this point, the BRD incidence in calves on this farm has been much lower than anticipated and only 2 calves have developed BRD (incidence, 0.93%). Average daily gain was 1.28 lb (0.58 kg)/day and 1.06 lb (0.48 kg)/day for the high and control groups, respectively. Average daily gain was comparable between calves in the high and paired (1.25 lb [0.57 kg]/day) groups.

Significance

This preliminary work demonstrates the growing potential of alternative management strategies for lowering the incidence of disease and increasing performance of dairy calves, as well as the use of behavioral monitoring to identify calves in the early stages of disease. Future work should include immune system challenges to quantify the response to disease with a known starting point to further elucidate the relationship between disease and behavioral changes.