The use of day level feeding behaviors to detect illness in group housed automatically fed pre-weaned dairy calves

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Introduction

Group housing and automatic feeding of dairy calves is gaining in popularity among dairy producers, yet disease detection remains a significant challenge of this management system. Software programs currently aim to assist in the detection of sick calves through such methods as flagging calves when there has been a 25% reduction in milk intake or in drinking speed as compared to a 3-day average. However, research suggests that using simple deviations in daily averages may not be useful, as calves have been shown to change behaviors only on the day of illness detection. The greater aim of our research program is to determine if we can use different approaches to examine feeding behavior that may improve the sensitivity and timeliness of detecting sick calves. The objective of the current study is to identify which feeding behaviors are most different between matched pairs of healthy and sick calves, and to determine if these changes differ by disease diagnosis.

Materials and Methods

This study was conducted on 10 dairy farms, 4 in Minnesota and 6 in Virginia, representing 14 feeders and 28 pens. Calves were enrolled between Feb and Oct 2014 at the time of entry to the group pen. Sick calves were detected and treated by farm personnel and all treatments recorded. Farms were visited weekly to collect feeding behavior measures from feeder software (drinking speed (DS) (mL/min), total milk consumed (CON) (L/d), and both rewarded (RV) and unrewarded (URV) visits to the feeder), and to record calf treatment events. Treated (TRT) and healthy calves (HT) were matched by age (+/- 7d), breed, sex, and pen. Day 0 was defined as the day of first illness detection by the producer. The date of treatment was matched for each pair of calves, with the 10 days before and after treatment used for the analysis. Linear mixed models were built to describe the association between feeding behaviors (DS, CON, RV, URV) and health status (HT/TRT) and also offered to control for age of calf, group size, region (MN/VA), disease diagnosis (scour/respiratory/ill thrift), days from illness event (-10 to +10), the random effect of farm, and repeated measures on calf. A stratified analysis was performed to explore the association between calf health status and feeding behavior by day from illness event, both overall and by pair disease diagnosis. Final significance was determined at $P<0.05$.

Results

Records were analyzed for 176 pairs of calves representing 5,984 calf days. Mean (SD) days on the feeder at first treatment event was 9.6 (8.1), with the average days treated of 3.2 (3.8). Illness events were classified as digestive disease (DIA; 55.1%, 97/176), respiratory disease (RD; 14.7%, 26/176), and ill thrift (ADR; 30.1%, 53/176). Rewarded visits to the automatic feeder were not significantly different between HT and TRT calves (0.2 ± 0.13 visits/day). Overall, HT calves drank 0.56 ± 0.1 L/d more than TRT calves. This difference was significant 2 days prior to detection for DIA calves (0.72 ± 0.25 L/d), but was not different for either RD or ADR calves. HT calves visited the feeder without a milk reward significantly more times (2.34 ± 0.41) than TRT calves over the days surrounding a treatment event. DIA, RD, and ADR calves differed in their URV to the feeder -2, -1, and 0 days before a treatment event, respectively. Overall, HT calves drank 88 ± 20 mL/min faster than TRT calves over the observation period. This difference was only significant on the day of illness detection for RD and ADR calves, but was different up to 3 days prior to detection for DIA calves.

Significance

Daily average CON, URV, and DS differed between matched pairs of sick and healthy calves, though these differences varied by disease diagnosis. The timeliness of these changes also varied by diagnosis and feeding behavior. As such, these 3 parameters may offer the greatest potential to be useful as an indicator of morbidity in group-housed, computer-fed calves. Continuing research is investigating this hypothesis.