Relationships Between Milk Acetone and Clinical Metabolic Disease in Dairy Herds

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Introduction

Negative energy balance in the post-partum dairy cow, as indicated by elevated blood and milk ketone levels, has been linked to decreased milk production and increased metabolic disease such as clinical ketosis and displaced abomasum. If groups of cows in negative energy balance could be identified in a cost-effective manner, management could intervene in a timely fashion to correct the problem. A collaborative project involving Foss Electric and Ontario Dairy Herd Improvement (DHI) was established to evaluate a prototype milk acetone analyzer that could test DHI milk samples for the presence of acetone. The objective was to investigate relationships between test-day milk acetone and incidence of clinical ketosis (Ket), displaced abomasum (DA) and lameness (Lame). The final data set included 199 herds, which had all milking cows tested for acetone on every DHI test date from January to September 1999. Included were 60,257 test day samples from approximately 14,000 cows. These herds recorded all occurrences of DA, Ket and Lame.

Results and Discussion

Variability in the milk acetone results was remarkably small. Few cows had elevated milk acetone levels (milk acetone > 0.1 mmol/L), and the elevated values were most likely to occur in the first two months after calving. Over the study period there were 287 DA events, 214 Ket events and 969 Lame events. While the Lame events were distributed throughout lactation, 75% of each of the DA and Ketosis events were diagnosed within the first 28 days after calving.

Very few disease events had an acetone determination on the date of diagnosis, so the most closely associated acetone determination within 21 days of the disease event was attributed to each disease event. Of the DA events 113 had an associated acetone determination prior to the disease event. Only 17 (15%) of these cows had an associated milk acetone value greater than 0.1 mmol/L. Of the Ketosis events 85 had an associated acetone determination prior to the disease event. Only 29 (34%) of these had an associated milk acetone value greater than 0.1 mmol/L. Of the Lame events 484 had an associated acetone determination which preceded the disease event. Only 8 (2%) of these lame cows had an associated milk acetone value greater than 0.1 mmol/L.

A potentially important incidental finding was that 16 of 41 cows with milk acetone determinations within 21 days after correction of a DA had significantly elevated milk acetone levels, suggesting that more aggressive medical treatment for the associated secondary ketosis might be indicated.

Conclusions

Test-day milk acetone was not found to be useful in identifying cows at risk for developing clinical metabolic disease or lameness. This is could be due to a problem with the timing of the milk sample collection relative to occurrence of the disease event. The highest prevalence of sub-clinical ketosis occurs within two weeks of calving. Given that most DHI testing programs have an interval of 30 to 45 days, and that cows less than 5 days in milk (DIM) on test day are not sampled, the probability of testing all cows within two weeks of calving is low. Therefore, testing of routine DHI samples is inefficient for identifying cows at risk of sub-clinical or clinical disease.