Feeding Behavior Identifies Cows at Risk for Metritis

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Abstract

Identification of sick animals is a key component of any dairy herd health program. Metritis, one common disease following calving, can be a costly disease to producers. These costs are incurred by increased days open, lower first-service conception, more inseminations, and failure to become pregnant, leading to involuntary culling. Clearly, an improved ability to identify or predict metritis will help avoid these costs by aiding prevention and early treatment. Previous research has indicated that cows with lower feed intakes are more likely to be diagnosed with metabolic and infectious diseases during the transition period. However, changes in feed intake must ultimately result from changes in feeding behavior. Moreover, feeding behavior has been shown to predict morbidity in feedlot steers and may be similarly useful for prediction of disease in transition dairy cows. There is little opportunity to monitor individual feed intake on commercial farms due to prohibitive costs; however, electronic monitoring of feeding behavior shows greater promise for commercial application. This paper will present and discuss studies conducted by our research group that provide evidence that changes in prepartum feeding behavior can be used to identify cows at risk of postpartum metritis.

Résumé

L'identification des animaux malades est un élément clé du programme de santé d'un troupeau laitier. La métrite, maladie courante après le vêlage, peut coûter cher aux producteurs : plus longue période pendant laquelle les vaches sont vides, taux de conception moins élevé à la première saillie, plus d'inséminations nécessaires, échec de la reproduction et réforme non volontaire plus élevée. Il est clair qu'une meilleure détection ou prédiction de la métrite permettra d'éviter ces coûts en facilitant la prévention et le traitement hâtif. Des recherches ont montré que les vaches ingérant moins d'aliments avaient plus de chances de souffrir de maladies métaboliques et infectieuses durant leur période de transition. Or, tout changement dans la prise alimentaire résulte d'un changement dans la façon de s'alimenter (comportement alimentaire). De plus, on sait que le comportement alimentaire des bouvillons en parc d'engraissement permet de prédire leur taux de morbidité. Il pourrait donc aussi servir à prédire les maladies des vaches laitières en transition. Il serait trop onéreux de surveiller la prise alimentaire de chaque vache dans les fermes commerciales. Toutefois, la surveillance électronique du comportement alimentaire est une alternative prometteuse. Dans cet article, nous présentons et discutons nos recherches, qui démontrent que le changement du comportement alimentaire avant le vêlage peut servir à identifier les vaches sujettes à la métrite post-partum.

Introduction

One of the most challenging periods a cow will face in her lactation cycle is the transition from late dry phase to early lactation. During this transition period, generally defined as three weeks before until three weeks after calving, the cow experiences a series of nutritional, physiological and social changes which may predispose her to metabolic and infectious disorders.

Metritis is an important postpartum disease due to its negative effects on the reproductive performance of dairy cows. Cows with metritis experience longer calving-to-first-service periods, longer periods from calving to conception, more inseminations, and failure to become pregnant.[1,4,12] Results from work done by Rajala-Schultz and Grohn[15,16] indicated that reproductive status of a cow was the single most important factor influencing a farmer's culling decisions, so metritis likely contributes indirectly to high rates of involuntary culling.

Incidence of metritis or endometritis varies among studies from 8 to 53% (14.8%[1], 7.6%[5], 53%[4], 16.9%[12]). This variation is likely due to differences in the diagnostic methods used to classify uterine infections. On the average dairy farm, disease detection is done by the veterinarian, but typically only during routine herd health checks, so in many cases early warning signs of disease go unnoticed until such time that the disease is in its clinical stages. Therefore, a practical method for continuously monitoring the health status of dairy cows may be extremely useful for producers.

Research on feedlot steers has shown that feeding behavior may be a useful tool for identifying sick animals and even predicting morbidity. Sowell *et al*[18,19] reported that healthy steers spent longer at the feed bunk and had more feeding bouts than sick animals. In a follow-up study, Quimby *et al*[14] determined that sick steers

could be identified four days earlier using electronic feed monitoring equipment, compared to the identification of sick animals by herdsmen.

The objective of our research is to identify transition dairy cows at risk for postpartum disease. In this paper we will review some of our recent findings showing how feeding and lying behavior change throughout the transition period and how changes in feeding behavior can be used to identify cows at risk for metritis.

Feeding and Standing Behavior

In our first study, we investigated the changes in feeding and lying behavior of 15 transition dairy cows monitored from 10 days before until 10 days after calving.[8] Daily time spent feeding was variable over the pre-calving period, but averaged 86.8 ± 2.95 minutes per day (Figure 1).

Cows reduced feeding time by about one hour a day after calving. Lower feeding times after calving may be explained by an increased feeding rate due to the switch to a higher energy diet immediately after calving. During the post-calving period, cows increased their feeding time by approximately 3.3 min/day most likely reflecting the rapid increase in dry matter intake that occurs during this period.[9,13]

The pre- and post-calving standing times determined in our study (12.3 and 13.4 hours per day, respectively) were in general agreement with the findings of other researchers[6,10,11] suggesting that standing time during the transition period is not much different than during other stages of lactation. However, we did note a dramatic increase (80 %) in the number of standing bouts from day 2 to the day of calving (Figure 2). This result suggests that cows were more restless, likely due to the discomfort associated with calving, and suggests that special attention should be placed on cow comfort in the maternity pen.

Feeding Behavior Predicts Metritis

In our second study we set out to test the prediction that cows exhibiting lower or reduced feeding behavior during the prepartum transition period would be at greater risk for developing disease post partum. We followed six Holstein heifers and 20 Holstein cows housed in a free-stall barn, and divided them into a prepartum and postpartum group. Although group size was kept constant, group composition was dynamic as animals moved between pens as they progressed though the transition period, as is typical of many commercial situations. An electronic system (Growsafe Systems Ltd, Airdrie, AB, Canada) was used to continuously monitor the feeding behavior of individual cows over the course of the study, and this data was used to estimate average daily feeding time. After calving, the cows were examined for metritis every 3±1 days, based on rectal body temperature and condition of vaginal discharge. Vaginal discharge (VD) was assigned a score from 0 - 4 based on a scale adapted from Dohmen *et al.*[2] As there is disagreement in the literature concerning which diagnosis criteria constitutes a case of metritis, two classifications were employed. Animals were classified as metritic if they showed a VD≥2 plus fever (≥ 103.1°F (39.5°C) within three days before observation of VD≥2) or acutely metritic if they showed a VD=4 plus fever.

Of the 26 cows used in this study, 18 cows or 69% experienced some degree of pathological discharge (VD≥2) with a range of onset from three to 15 days in milk (DIM). Our proportion of animals showing signs of metritis was similar to that reported by Dohmen *et al*[2] (80%) and Hirvonen *et al*[7] (66%), who used similar diagnostic criteria and comparable days of diagnosis. Cows diagnosed with either metritis or acute metritis spent less time feeding during the post-calving period (d+2 to d+19 relative to calving) than did their healthy coun-

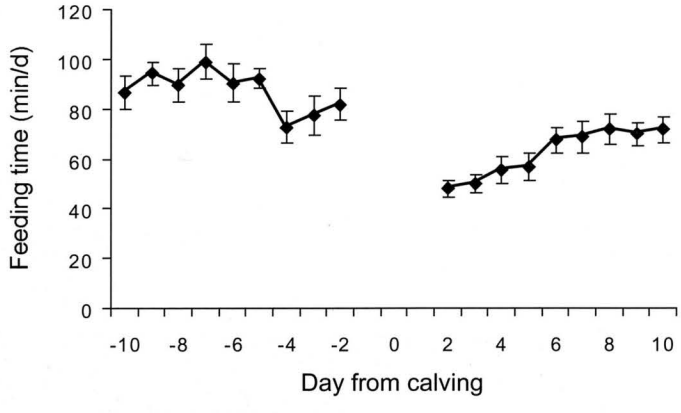

Figure 1. Changes in mean (± SE) daily feeding time during the transition period (from Huzzey *et al*[8]).

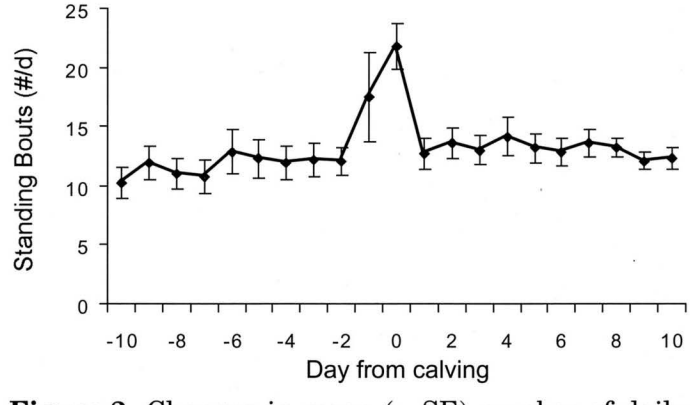

Figure 2. Changes in mean (± SE) number of daily standing bouts over the transition period (from Huzzey *et al*[8]).

terparts. Work completed by Zamet *et al*[21] on the health and feed intake of free-stall housed cows over the transition period similarly showed that metritic cows had a 21% lower dry matter intake (DMI) post-calving than healthy cows, however the researchers failed to detect any difference in DMI between these two groups before calving. In our study, cows diagnosed with acute metritis showed significantly lower feeding times during the pre-calving period (d–12 to d–2 relative to calving; Figure 3). These results suggest that feeding behavior may be a more sensitive indicator of disease than measures of individual feed intake.

Prepartum feeding was able to account for a significant proportion of the variance in acute metritis, with cows doubling their risk of developing metritis with every 10-minute decrease in prepartum feeding time. Diagnostic criteria are most useful when they are both sensitive and specific, meaning they should be good at identifying all the cows with true cases of metritis, but at the same time avoiding the inaccurate diagnosis of a healthy cow as having metritis. Based on the data collected from our monitoring system, 75 min/day feeding seems to function as a useful predictive threshold, resulting in a sensitivity of 71% and specificity of 77% for metritis and a sensitivity of 89% and specificity of 62% for acute metritis (Figure 4). The sensitivity and specificity values described here are comparable to those described for indicators of other transition diseases. For example, thresholds for on-farm milk and urine ketosis tests range in sensitivity from 76-80% and in specificity from 76-93%.[3] Somatic cell count thresholds for mastitis detection were only 61-64% sensitive and 65-70% specific in one study.[17]

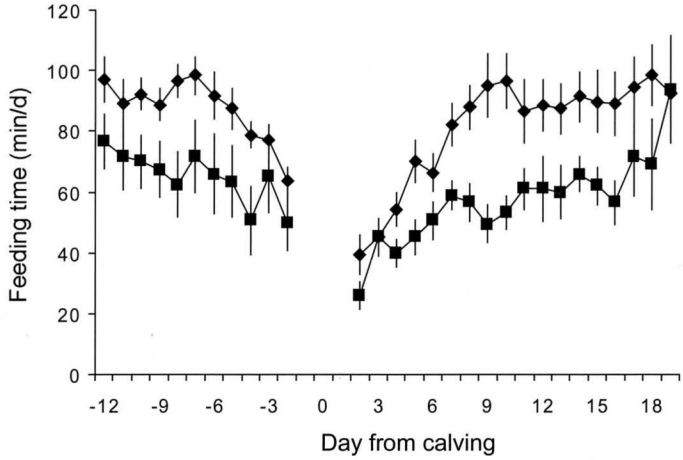

Figure 3. Daily mean feeding time (min/day) of nine Holstein cows with acute metritis (■) and 19 Holstein cows without acute metritis (◆) (±SE) from 12 days before until 19 days after calving (adapted from Urton *et al*[20]).

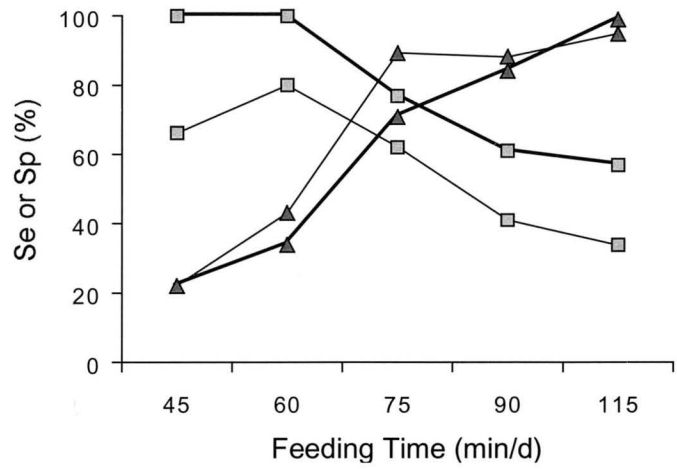

Figure 4. Sensitivity (Se; Δ) and specificity (Sp;□) of predictive thresholds of mean daily feeding time (min/d) over the trial period (pre- and postpartum periods combined) to identify Holstein cows with metritis (—) or acute metritis (–) (adapted from Urton *et al*[20]).

Future Research Directions

Further work is needed to understand the factors that mediate the link between feeding behavior and the incidence of postpartum diseases, including the relationship between feeding behavior and feed intake. As well, a variety of animal factors may be useful for improving our ability to identify animals at risk for disease. Our research group is in the process of conducting a new study that will begin to address these gaps in the literature by exploring the relationships between social competition, behavior and intake, and how these relate to diseases common after calving.

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