Preventive Veterinary Medicine 145 (2017) 16–22

Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed

Prevalence and risk factors for transition period diseases in grazing dairy cows in Brazil

Rolnei R. Daros[a], Maria J. Hötzel[b], Jose A. Bran[b], Stephen J. LeBlanc[c], Marina A.G. von Keyserlingk[a,*]

[a] Animal Welfare Program, Faculty of Land and Food Systems, University of British Columbia, Vancouver, Canada
[b] Laboratório de Etologia Aplicada e Bem-Estar Animal, Departamento de Zootecnia e Desenvolvimento Rural, Universidade Federal de Santa Catarina, Florianópolis, Brazil
[c] Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, Canada

ARTICLE INFO

Article history:
Received 21 February 2017
Received in revised form 4 June 2017
Accepted 8 June 2017

Keywords:
Hyperketonemia
Vaginal discharge
Pasture based systems
Animal welfare
Dairy management

ABSTRACT

The aim of this cross-sectional study was to describe the incidence risk of dystocia, retained placenta (RP), pathological recumbence (down cow), the prevalence of metritis and subclinical ketosis (SCK), and the risk factors for SCK, metritis, and RP in grazing dairy herds in Southern Brazil. Fifty-three herds were visited 2–6 times from February to October of 2015. Body condition score (BCS), breed, days in milk (DIM), parity and disease status were recorded for each cow that was between 3 and 21 DIM at the time of the visits. Management practices were determined using a survey and environmental inspection was performed on each visit. SCK was identified if blood β-hydroxybutyrate was ≥1.2 mmol/L and metritis by inspection of the vaginal discharge; cows were assessed once between 3 and 21 DIM. Multilevel logistic regression models, controlling for farm as a random effect, were built to identify risk factors for each disease and to assess the proportion of variance at the herd and cow levels. Models were constructed based on causal diagrams and variable screening. Overall, prevalence of SCK and metritis and incidence risk of RP were 21, 11 and 14%, respectively. Reported incidence risk of down cow was 6% and displaced abomasum was 1%. The odds (OR; 95% CI) of a cow having SCK were higher in herds with high (>10%) incidence of down cows (2.7; 1.4–5.0), limited access to water (1.9; 1.1–3.1), Jersey cows (OR: 2.2; 1.2–4.1) and in cows that were in third or greater lactation (2.9; 1.4–5.5). BCS 3.0–3.5 decreased the odds (0.4; 0.2–0.8) of metritis, while DIM, RP and being in a herd with a dirty holding area increased the odds of metritis by 1.1 (1.1–1.2), 19.5 (9.9–38.3) and 2.1 (1.0–4.2) fold, respectively. Parity >2 and dystocia increased the odds of RP by 2.4 (1.2–4.6) and 3.0 (1.6–5.4) fold, respectively. Jersey breed, use of a maternity pen and keeping the newborn calf with the cow >12 h decreased the odds of having RP by 0.1 (0.0–0.4), 0.5 (0.3–1.0) and 0.4 (0.2–0.8) times, respectively. The variation in disease occurrence was largely dependent on cow-level factors. However, herd level risk factors also influenced disease occurrence and should be considered in order to design better preventive transition period diseases protocols.

1. Introduction

Dairy cattle health management is evolving from a focus on treatment to prevention (LeBlanc et al., 2006). Cows are at high risk for developing infectious, metabolic, and other diseases in the weeks immediately following calving (Mulligan and Doherty, 2008). Although much research has focused on understanding the risk factors for transition period disease in intensively-managed housed dairy cows, far less research has focused on grazing dairy cows, despite much of the world relying on grazing as a major component in the dairy production systems (e.g. Argentina: Cappellini, 2011; Ireland: Läpple et al., 2012; and New Zealand: MacLeod and Moller, 2006). Furthermore, there is a dearth of information on disease prevalence and the between-herd variability and associated herd- and cow-level risk factors in pasture-based dairy systems. Understanding the risk factors associated with transition period diseases in grazing herds may help to overcome some of these problems.

During the transition period the identification of metabolic disorders frequently relies on monitoring subclinical cases using validated cow-side tests (e.g. Iwersen et al., 2009). In the case of ketosis this involves quantification of β-hydroxybutyrate (BHB)

* Corresponding author at: 2357 Main Mall, Vancouver, BC, V6T 1Z4, Canada.
E-mail address: nina@mail.ubc.ca (M.A.G. von Keyserlingk).

http://dx.doi.org/10.1016/j.prevetmed.2017.06.004
0167-5877/

in blood; for example, BHB concentrations of 1.0–1.4 mmol/L are widely accepted as indicative of subclinical ketosis (SCK) which in turn is associated with increased risk of displaced abomasum (DA; LeBlanc 2010; McArt et al., 2013), metritis (Duffield et al., 2009) and increased culling rates (LeBlanc, 2010; McArt et al., 2013). Factors associated with SCK include high body condition score (BCS) during the dry period (Vanholder et al., 2015) and changes in BCS during transition (Kaufman et al., 2017), parity (Berge and Vertenten, 2014) and low dry matter intake (DMI) before calving (Goldhawk et al., 2009). Management practices that have been associated with SCK occurrence include type of feeding system (Berge and Vertenten, 2014) and feeding frequency (Gustafsson et al., 1995).

The prevalence of SCK in grazing dairies is not well described, with the exception of the recent work in New Zealand by Compton et al. (2014) that reported a 24% herd prevalence of SCK (serum BHB ≥ 1.2 mmol/L) in cows 7 to 12 DIM, which is similar to SCK prevalence for indoor housed cows in the same period (see Duffield et al., 2009). However, SCK prevalence in indoor housing systems varies likely due to differences in DIM and sampling frequency (see review by McArt et al., 2013).

Another common disease during the transition period disease is metritis, broadly defined as clinical illness due to inflammation of the uterine tissue caused by bacteria or associated toxins. It occurs within 2 weeks after calving (i.e. puerperal metritis; clinical signs including fever >39.5 °C, red-brown watery vaginal discharge) (Sheldon et al., 2006). Metritis has been associated with decreased milk production, lower reproductive performance and early culling (Giuliodori et al., 2013). Several risk factors have been described for metritis, including dystocia, retained placenta (RP), and lower BCS (Dubuc et al., 2010). As with most production diseases, few studies have been done on grazing cows. Bruun et al. (2002) reported that the incidence of metritis was lower for grazing cows than for housed cows.

Retained placenta – failure to pass fetal membranes within 24 h after calving – has been associated with poor reproduction and lower milk production (Dubuc et al., 2011). The complex interactions between the stress response, the immune system and the occurrence of RP are not well understood (Beagley et al., 2010). To our knowledge no study has attempted to identify potential risk factors for RP in dairy cattle on pasture-based systems.

The objectives of this study were to measure the prevalence of the most common transition period diseases in intensively-managed grazing herds and to identify risk factors for SCK, metritis and RP, specifically focusing on management and environment-related factors.

2. Materials and methods

This study was carried out between February and October of 2015 in the western part of Santa Catarina State in Brazil, as part of a larger study that also focused on dairy cattle lameness and stakeholder views of dairy production in Brazil. All procedures were approved by the Ethics Committees on Research on Humans (Protocol # PP1237779, 2015) and Animals of the Universidade Federal de Santa Catarina (Protocol # PP00949, 2014) and by the UBC Animal Care Committee (Protocol # A15-0082). R.R.D, J.A.B and two research assistants visited the farms and collected all of the data.

2.1. Selection of participants

In order to capture representative variability in herd management practices and environmental conditions, and based on the time available to carry out the study, we set out to visit a minimum of 50 farms. The criteria for selection of dairy farms were herd size of approximately 40–100 cows and cows housed on pasture for at least 16 h/d. Potential participant farms were identified by members of the research team via informants (i.e. people working in the dairy sector – public and private). To minimize selection bias, informants were only aware of the general aim of the study, i.e. to determine the prevalence of diseases on dairy farms in their region. After the farms were selected, the members of the team visited each farm, where they initially explained the study's general and specific methodologies, as well as their role in the study. Consent forms were read and explained to the farmers. We approached 61 farms initially, from which 53 farms gave consent to participate in the study. For those who agreed to participate, a first visit was scheduled at a time that was convenient for the farmer.

2.2. Data collection

A three-step approach was used to collect the data for this study, including a semi-structured interview, inspections of the environment and examinations of the cows.

2.2.1. Questionaire

The survey questionnaire was loaded onto smartphones to facilitate data collection and handling. The questions were verbally communicated to the farmer and their responses captured during a face-to-face interview that took place at the first visit. To initiate the conversation with the farmer, general information was collected in the first half of the interview, including location of the farm, size, number of cows and milk yield per cow. Questions regarding feeding management of milking and dry cows, dry period management, pre- and postpartum management, prevalence and incidence of diseases and health management were introduced in the second half of the interview. The interviews took from 1.5 to 3 h.

2.2.2. Environment inspection

All environment inspections were performed during the first and a subsequent visit (2–4 months apart); this allowed for one environmental inspection during the summer and a second during the winter months. During these visits we observed one milking and walked through the grazing paddocks used to house the lactating, dry, and close-up cows, the feeding barn and the holding areas. Data regarding floor surface cleanliness of the barn (0 = clean, 1 = dirty), access to water, access to shade, number of paddocks, types of grass, type of general milking management and time spent in holding areas waiting to be milked were recorded, as described below. All farms were intensively managed, as described by Balcão et al. (2017). Stocking density ranged from 2 to 3 cows/ha, cows were milked twice a day and had access to 2–3 fresh paddocks per day covered with specific grazing grasses such as *Cynodon dactylus* (var. Tifton 85–Bermuda grass) and *Megathyrsus maximum* (var. BRS kurumi) during the summer months and *Avena sativa* (oat) and *Lolium perenne* (ryegrass) during the winter months. In all farms cows were supplemented with corn silage and concentrate 1–3 times a day in a designated feeding area with headlocks. Cows were bred and calved throughout the year.

2.2.3. Cow examination

As visits were scheduled upon farmer availability, no randomization was used to select cows, i.e., all cows from 3 to 21 DIM were assessed at the visits. In order to assess at least 12 eligible cows per farm, we visited each farm between 2 and 6 times. Cows were not assessed more than once during the transition period and farmers were always present for cow examinations.

Cows were identified by farm and name or tag number and subjected to a number of measures. Cows were assigned a BCS while restrained in headlocks using a 0.25-increment scale (Ferguson et al., 1994). A validated cow-side hand-held meter (Precision Xtra β-ketone, Abbott Diabetes Care) was used to measure BHB in whole