

Association between prepartum nonesterified fatty acids serum concentrations and postpartum diseases in dairy cows

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Introduction

The peripartum period is challenging for dairy cows. Changes occurring during this period increase susceptibility of dairy cows for metabolic and infectious diseases. Prepartum non-esterified fatty acids (NEFA) serum concentrations have been shown to be associated with the risk of postpartum diseases in previous studies. The objective of the present study was to confirm the association between prepartum NEFA concentrations and postpartum diseases occurring during the first 30 days in milk (DIM). A secondary objective was to identify optimal thresholds allowing identification of animals at greater risk of postpartum diseases. Our hypothesis was that prepartum NEFA concentrations are higher in animals that subsequently develop postpartum diseases compared to healthy animals.

Materials and methods

We conducted a prospective cohort study over a 1-year period on 52 commercial Holstein dairy farms that were regular clients of the bovine ambulatory clinic of the Faculté de médecine vétérinaire of the Université de Montréal (St-Hyacinthe, QC, Canada). Herd were selected by convenience based on being enrolled in a preventive veterinary medicine program involving herd health visits every 14 days, and on being willing to participate. At every herd visit, blood samples were taken from all cows within 35 days (± 7) of subsequent predicted calving date. The samples were centrifuged (3,500 rpm \times 10 minutes) and sera were stored at -20°C . After calving, the number of days between sampling and calving were calculated. Cows sampled between 1 and 14 days before calving were included in the study; their serum samples were submitted for quantification of NEFA concentrations. Data about diseases occurring during the first 30 DIM were collected. Disease definitions were standardized during the study and included: retained placenta (RP; ≥ 24 hours after calving), hyperketonemia (HK; BHBA ≥ 1.4 mmol/l) during the first 15 DIM, displaced abomasum (DA) during the first 30 DIM, and puerperal metritis (MET) during the first 20 DIM (fetid watery vaginal discharge with general signs of illness). Diseases were diagnosed by veterinary practitioners except for RP. Descriptive statistics and multivariable mixed logistic regression models were computed. Diseases were considered to be the dependent variables (individually and collectively) of each model. Independent variables included prepartum NEFA serum concentration, parity, and season of calving. At first, NEFA concentrations were offered to the models as a continuous variable. Subsequently, NEFA concentrations were dichotomized in order to find the optimal thresholds using non-nested models (lowest AIC value).

Results

A total of 1,300 cows were included in the study. The incidence of postpartum diseases was 10.2% for RP, 19.9% for HK, 16.3% for MET, and 7.2% for DA. Overall, 44.3% of cows had experienced at least one disease during the first 30 DIM. The NEFA concentration was associated with a greater risk of developing every individual disease collected in the study ($P < 0.05$). Based on the lowest AIC value from non-nested models, the optimal NEFA thresholds were ≥ 290 $\mu\text{Eq/L}$ for RP (OR 2.2, 95%CI: 1.5-3.1; $P < 0.01$), ≥ 230 $\mu\text{Eq/L}$ for HK (OR 2.2, 95%CI: 1.5-3.2; $P < 0.01$), ≥ 300 $\mu\text{Eq/L}$ for MET (OR 4.0, 95%CI: 2.7-5.7; $P < 0.01$), and ≥ 300 $\mu\text{Eq/L}$ for DA (OR 4.2, 95%CI: 2.9-6.1, $P < 0.01$). The optimal threshold for identifying cows at greater risk of having at least one disease during the first 30 DIM was ≥ 280 $\mu\text{Eq/L}$ (OR 4.2, 95%CI: 2.9-6.1; $P < 0.01$).

Significance

These study results confirm the association between prepartum NEFA serum concentrations and postpartum diseases. The optimal thresholds found in the present study were similar to those reported elsewhere. We can conclude that prepartum NEFA thresholds between ≥ 280 and ≥ 300 $\mu\text{Eq/L}$ allows to identify animals at greater risk of developing most postpartum diseases.

