The Metabolic Predictors of Post-partum Diseases and Culling Risk in Dairy Cattle

H.A. Seifi[1], *DVM, DVSc;* **S. J. LeBlanc**[2], *DVM, DVSc;* **K.E. Leslie**[2], *DVM, DVSc;* **T.F. Duffield**[2], *DVM, DVSc*
[1] *School of Veterinary Medicine, Ferdowsi University of Mashhad, Iran*
[2] *Ontario Veterinary College, University of Guelph, Canada*

Introduction

The risk of peripartum diseases of dairy cows is mostly influenced by the nutritional and metabolic status of the cow. It is well known that negative energy balance is a problem of early lactation cows arising from milk energy output and relatively low feed intake. A large reduction in energy balance around calving may cause periparturient health disorders of dairy cattle. The objective of this study was to identify metabolites and potential cut-points associated with increased risk of subsequent metabolic diseases and culling for practical application in the monitoring of transition cows.

Materials and Methods

A prospective study was conducted to determine the relationship between serum non-esterified fatty acids (NEFA), beta hydroxybutyrate (BHBA) and calcium (Ca) and the occurrence of displaced abomasums (DA), clinical ketosis and culling in Holstein cows in Guelph, Ontario. Eight hundred and forty-nine cows from sixteen farms were sampled three times in the first, second and third week after parturition. Serum biochemical analyses (BHBA, NEFA and Ca) were conducted at the Animal Health Laboratory, University of Guelph. The cows were under observation for disease occurrence from the date of calving until 61 days in milk (DIM). There were 22 cases of DA, 31 cases of clinical ketosis and 39 cases were culled. Multivariable logistic regression was used to evaluate the probability of disease occurrence. In addition to accounting for the effect of metabolite , covariates included parity group, BCS class at 1st sampling and occurrence of retained placenta, metritis and milk fever.

Results

There were 22 cases of DA and 31 cases of clinical ketosis. Thirty-nine cows were culled. Within the first week after calving, cows with BHBA concentration ≥1000 μmol/l and Ca concentrations ≤2.3 mmol/l were 19.26 and 5.91 times more likely to develop DA, respectively. Within second week after calving, cows with the same Ca cutoff point and NEFA concentrations≥ 1.0 mmol were 4.15 and 4.22 times more likely to develop DA. The odds of culling were 3.84 times greater in cows with serum NEFA ≥1.0 mmol/l and 5.46 times greater for cows with serum Ca concentrations ≤2.3 mmol/l in the first week after calving. Within the second week after calving, Ca (with cutoff point ≤2.3 mmol/l) and NEFA (with cutoff point of ≥ 0.9 mmol/l) were associated with subsequent culling risk. The odds ratios were 5.34 and 2.12, respectively. NEFA concentrations were most associated with the occurrence of clinical ketosis within 2 weeks after calving. The odds ratios for clinical ketosis were 7.35 and 7.82 at first and second week post-partum. BHBA concentrations were associated with the subsequent occurrence of clinical ketosis in the first week after calving and Ca concentrations in the second week. Body condition score was a significantly associated with the occurrence of clinical ketosis.

Significance

Serum BHBA, NEFA and Ca concentrations have potential as indicators of the risk of DA, clinical ketosis and culling risk in dairy cows. Energy insufficiency and low Ca concentrations were associated with occurrence of DA, clinical ketosis and culling rate. The significant association of Ca cut-points with the subsequent risk of DA, clinical ketosis and culling was unexpected. There is a report from one herd where subclinical hypocalcemia was identified as a risk for LDA, but there are conflicting data from field studies on the effect of oral supplementation of Ca around calving on the incidence of LDA. It is worth noting that there are several publications indicating the association of negative energy balance with some metabolic diseases post-partum. LeBlanc et al. (2005) showed that the timing and magnitude of peripartum increases in circulating concentrations of NEFA and BHBA are associated with the risk of eventual abomasal displacement.