

Metabolic Changes in Cows with or without Retained Fetal Membranes in Transition Period

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Summary

The purpose of the study was to evaluate the effect of retained fetal membranes (RFM) on serum minerals and energy- and protein-related metabolites in dairy cows at a herd with a recent history of fatty liver syndrome. Forty-seven multiparous Holstein cows were selected during transition period. Nine cows had RFM longer than 24 h after calving. Blood samples were obtained on prepartum days 21 and 7 and postpartum days 7 and 21. We used repeated measure procedure of ANOVA to evaluate the effect of RFM on serum metabolites. Cows with RFM had significantly higher concentrations of β -hydroxybutyrate, non-esterified fatty acids and triglycerides after calving, but had lower concentrations of cholesterol during transition period. The concentrations of serum albumin and blood urea nitrogen were also significantly lower in RFM-affected cows than non-affected ones after parturition. Our results suggested that negative energy balance (NEB) postpartum was associated with RFM in dairy cattle. However, our findings did not reveal a cause and effect relationship with respect to the role of NEB as a possible risk factor for RFM.

Introduction

One of the most common and difficult problems seen in the periparturient period of dairy cattle are retained fetal membranes (RFM) (Smith and Risco, 2005). Both the mechanism of placenta expulsion and the cause of RFM remain unclear. RFM occur when the detachment of fetal membranes (cotyledons) from the maternal caruncles does not occur within the first 12–24 h after calving (Eiler, 1997). Various risk factors such as age, heredity, environment hormones and nutrition have been suggested as causes of RFM (Hurley and Doane, 1989; Barnouin and Chassagne, 1991). However, data are conflicting and no single endocrine or nutritional factor provides a satisfactory explanation for why cows develop RFM (Kimura et al., 2002).

Immune system integrity before calving was suggested to be important to prevent RFM. Neutrophils isolated from cows that experienced RFM had significantly lower function than cows without RFM, before calving and during the first 2 weeks postpartum (Kimura et al., 2002). Immune system activity and RFM occurrence have been related to vitamin E and selenium prepartum supplementation, body condition score (BCS) dynamic, and energy balance status (Melendez and Risco, 2005).

The purpose of the study reported here was to compare serum minerals and energy- and protein-related metabolites in dairy cows with and without RFM in transition period at a herd with a recent history of fatty liver syndrome.

Materials and Methods

Study design, sample collection and animal groups

The study was designed as a cohort study with multiple observations per animal. Sixty multiparous Holstein cows in a dairy farm were initially selected for the study and data were collected between May and October 2003. The herd consisted of approximately 900 lactating cows and the average milk yield was 28.5 kg. The herd had a history of fatty liver during past 6 months. Fatty liver was confirmed in eight cows on the basis of necropsy and histopathological findings. The cows were fed total mixed ration composed of hay, corn silage, concentrates, minerals and salt. Thirteen cows with symptoms of clinical diseases (such as mammary infection, milk fever and fatty lipidosis) were excluded from the study population, resulting in a final sample of 47 cows.

Nine cows had RFM longer than 24 h after calving. The evaluation for RFM was conducted visually and vaginally by the veterinarian 24 h after calving. Blood samples were obtained on prepartum days 21 and 7 and postpartum days 7 and 21. Because of the difficulty in predicting calving day, samples taken prior to calving were grouped as day 22 prior to calving (SD = 3.53) and day 8 (SD = 3.48).

Blood was taken via jugular venipuncture into a plain glass tube in which the blood was allowed to coagulate. All samples were transported to the laboratory within 1 h after collection. Serum was harvested after centrifugation frozen and stored at -20°C until analysis.

Individual milk production data were determined every month. Cows were compared on the basis of BCS using a scale from 1 to 5 according to Edmonson et al. (1989) at the parturition (cows whose BCS was ≤ 3.5 with those whose BCS was > 3.5). During the entire study the same person performed all clinical examinations and BCS.

Laboratory analyses

Blood chemistry was analysed according to the following colorimetric methodologies, total protein: biuret reaction