Investigation of the Relationship Between Resumption of Ovarian Cyclicity and Plasma Nutritional Markers in Lactating Dairy Cows

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Previous studies have shown the association between metabolic hormones, ovulation intervals and reproductive performance. The objective of this study was to examine the relationship between the resumption of ovarian activity and plasma nutritional markers which included glucose, non-esterified fatty acids (NEFA), plasma urea nitrogen (**PUN**), cholesterol and beta-hydroxybutyrate (**BHBA**). Forty-three lactating Holstein cows, housed in a free stall barn, were randomly selected from a commercial herd. From Week 2 to Week 7 postpartum, weekly ultrasonography and blood sampling were performed to characterize ovarian status, plasma metabolites, and blood progesterone. In addition, BCS were recorded on Week 2 and Week 7. The occurrence of the first postpartum ovulation was determined by the analysis of plasma progesterone and confirmation of ovulation using visualization of a corpus luteum by ultrasonography. Based on plasma progesterone concentration and ovarian status, cows were divided into two treatment groups. Cows that ovulated ≤ 25 DIM were designated early ovulators (**EO**) and cows that ovulated > 25 DIM were considered late ovulators (**LO**). Data were analyzed using mixed model analysis of variance for repeated measures. The mean interval to 1st ovulation for EO was 16.7 d, and for LO was 34.7d ($P < 0.05$). Mean BCS was greater ($P < 0.05$) for EO than LO (3.3 ± 0.1 vs 2.9 ± 0.1). There were effects of Week ($P < 0.01$) and Week by Group interaction ($P < 0.05$) on blood cholesterol. Mean blood cholesterol increased over time for both EO and LO; however, mean cholesterol concentrations between weeks 2 and 3 were reduced ($P < 0.05$) for EO when compared with LO. Across all weeks, the mean glucose concentrations tended to be greater ($P = 0.06$) in EO than LO. There were no effects of Group, Week, or their interaction on blood BHBA. Blood NEFA did not differ between EO and LO; however, the mean plasma NEFA concentrations decreased over time ($P < 0.01$) for both groups. Mean PUN was not different between EO and LO throughout the experiment. Greater blood glucose postpartum and/or lower cholesterol increases the probability of first ovulation by day 21 postpartum in lactating dairy cows. These results provide evidence that the 1st postpartum ovulation may be associated with blood glucose and cholesterol during the early postpartum period and may be indicative of the resumption of reproductive function in lactating dairy cows.

Keywords: blood metabolites, dairy cows, ovulation