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## Relationship Between Body Condition Score Change During the Prepartum Period and Week Four Milk Yield of Dairy Cows

### Abstract

The objectives of the study were to (1) evaluate the association between body condition score (BCS) change in the prepartum period and week four milk yield and (2) explore whether average week four milk yield can be used as an indicator of the percentage of cows having BCS loss before calving at the herd level. Cows that had excessive BCS loss had decreased milk yield in early lactation relative to cows that did not change BCS or had moderate BCS loss in the dry period. Nonetheless, monitoring average week four milk yield does not appear to be a reliable indicator of the percentage of cows that underwent excessive BCS loss in the prepartum period. In conclusion, despite its association with BCS change during the dry period, week four milk yield cannot be used as a reliable parameter to monitor whether cows experience excessive BCS loss before calving.

### Keywords

body condition score, prepartum period, postpartum milk production

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## Relationship Between Body Condition Score Change During the Prepartum Period and Week Four Milk Yield of Dairy Cows

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### Summary

The objectives of the study were to (1) evaluate the association between body condition score (BCS) change in the prepartum period and week four milk yield and (2) explore whether average week four milk yield can be used as an indicator of the percentage of cows having BCS loss before calving at the herd level. Cows that had excessive BCS loss had decreased milk yield in early lactation relative to cows that did not change BCS or had moderate BCS loss in the dry period. Nonetheless, monitoring average week four milk yield does not appear to be a reliable indicator of the percentage of cows that underwent excessive BCS loss in the prepartum period. In conclusion, despite its association with BCS change during the dry period, week four milk yield cannot be used as a reliable parameter to monitor whether cows experience excessive BCS loss before calving.

### Introduction

Evaluation of postpartum performance is critical to monitor transition cow programs of dairy herds. Poor transitions from late gestation to early lactation can affect health, production, reproduction, and lifetime profit of dairy cows. Events such as pen moves and diet changes during the transition period may impair postpartum performance. In addition, management practices in the prepartum pen can affect dry matter intake of cows, mobilization of body fat before calving, and, consequently, overall performance in the postpartum period. Therefore, monitoring herd parameters related to postpartum performance can assist in evaluating the transition cow program of dairy herds.

It has been suggested that week four milk yield can be used as an indicator of transition cow performance and a predictor of future production of dairy cows. It is possible that reduced week four milk yield of the herd may indicate limited feed intake in the pre- and postpartum period, substantial changes of body condition score (BCS) during the transition period, and increased proportion of cows with postpartum diseases. Nonetheless, to our knowledge, no published studies have evaluated the validity of week four milk yield for monitoring transition cow programs at the herd level. The objectives of this study were to evaluate the association between BCS change in the prepartum period and week four milk yield and explore the possibility of using week four milk yield as an indicator of percentage of cows that had excessive BCS loss before calving.

## Experimental Procedures

Body condition score was assessed for 1,244 dry Holstein cows from 3 commercial dairy herds (Dairy A = 448; Dairy B = 433; Dairy C = 363 cows). Assessment consisted of evaluating cows (lactation  $\geq 1$ ) on a scale of 1 to 5 (1 = severe underconditioned; 5 = obese) at 242 days of gestation and in the first week after calving. Cows were classified according to the difference of BCS from the prepartum period to the first week of lactation: excessive loss (E-loss:  $\leq -0.75$ ), moderate loss (M-loss:  $-0.5$  and  $-0.25$ ), and no loss (No-loss:  $\geq 0$ ). Cows were housed in dry-lot corrals with shades during prepartum period. In the postpartum period, cows from one of the herds (Dairy C) were housed in freestall barns with access to a dirt exercise lot. Dairies A and B housed postpartum cows in dry-lot corrals. Weekly milk yield from weeks 1 to 4 were extracted from the on-farm management software of the herds. Occurrence of twinning and uterine diseases in the first three weeks of lactation were also extracted from the same software.

Cows calved during a 72-d period and were grouped biweekly to evaluate whether average week four milk yield could be used as an indicator of the proportion of cows that experienced excessive BCS loss in the prepartum period.

Data were analyzed statistically by using SAS (version 9.4, SAS Inst. Inc., Cary, NC). Week four milk yield was analyzed using a mixed-effects statistical model. Body condition score change, dairy, twinning, and dairy  $\times$  BCS change were included as fixed effects. Milk yield in the first four weeks of lactation was analyzed using BCS change, dairy, twinning, week, dairy  $\times$  BCS change, dairy  $\times$  week, week  $\times$  BCS change, and dairy  $\times$  week  $\times$  BCS change as fixed effects.

## Results and Discussion

The negative impact of BCS loss in the prepartum period was previously demonstrated in a large observational study that evaluated 16,104 lactations. Cows that had excessive BCS loss from dry-off to calving had reduced 3.5% fat-corrected milk in the subsequent lactation compared with cows that did not have excessive BCS loss. Similar findings were observed in the current study, in which BCS change in the prepartum period tended ( $P = 0.07$ ) to be associated with week four milk yield (Figure 1). Cows with excessive BCS loss had decreased ( $P \leq 0.04$ ) week four milk yield compared with cows with moderate or no BCS loss. In addition, milk yield in the first four weeks of lactation decreased ( $P < 0.01$ ) for cows that had excessive BCS loss vs. cows that had moderate or no BCS loss (Figure 2; E-loss =  $76.4 \pm 3.9$ ; M-loss =  $82.5 \pm 3.7$ ; No-loss =  $83.3 \pm 3.8$  lb/day). In these analyses, there were no interactions between dairy and BCS change. These studies demonstrate strong evidence of the impact of prepartum BCS change on milk production after calving. In the current study, the three herds had milk meters, which allowed us to evaluate precisely the association between BCS change and milk production in early lactation because of daily milk yield. The dairies utilized in the previous study did not have milk meters, but cows were tested monthly, therefore, milk yield and components were evaluated for the entire lactation (305 days).

In the current study, the percentage of cows having excessive, moderate, or no BCS loss were 16%, 49%, and 35%, respectively. In the previous report, 10% of cows

had excessive BCS loss, whereas 40% and 60% had moderate loss and no BCS loss, respectively. The current study was conducted during the summer, which may be the reason for a greater proportion of cows having excessive BCS loss. Heat stress is associated with reduced feed intake and may result in a greater percentage of cows mobilizing body energy reserves.

Although there is an association between prepartum BCS loss and milk production after calving, week four milk yield is not a good indicator to estimate previous BCS change in the dry period (Figures 3 and 4). Week four milk yield has been used anecdotally to assess transition cow performance at dairy farms. Indeed, in DairyComp, on-farm software widely adopted by U.S. dairy producers, week four milk yield is calculated for each cow and it is utilized in reports to screen for transition cow problems and estimate 305-day mature equivalent milk yield. To assess whether week four milk yield could be used as an indicator of BCS change in the dry period, average week four milk yield and percentage of cows not having excessive BCS loss was calculated for cohorts of cows that calved within a 14-day period (biweekly timeframe). The rationale for grouping cows that calved in a 14-day period was to investigate the value of evaluating average week four milk yield on a frequent basis at dairy farms. Results from the current study suggest that average week four milk yield calculated from cohorts of cows does not indicate whether a large proportion of those cows lost excessive BCS in the prepartum period. In dairy A, for example, the percentage of cows that did not lose excessive BCS prepartum varied from 76 to 91% in the biweekly cohorts, whereas there was a small variation in average week four milk yield, ranging from 98 to 102 lb/day (Figure 3). Similar findings were observed when we also accounted for proportion of cows having postpartum uterine diseases in the first 3 weeks after calving (Figure 4), presenting evidence that it is unclear if week four milk yield can be used as a parameter to evaluate performance of transition cows in dairy herds.

It is likely that several factors impact week four milk yield, not only prepartum BCS change or postpartum uterine disease. Even though week four milk yield is associated with BCS change before calving, week four milk yield does not seem to be a reliable parameter to evaluate BCS change during the dry period in dairy herds.

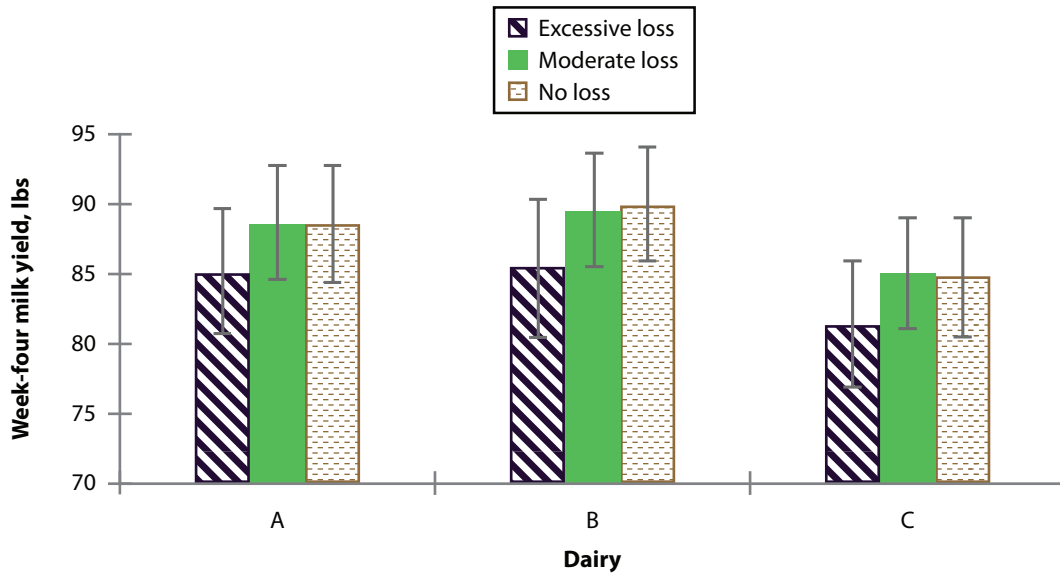


Figure 1. Week four milk yield of cows that had excessive loss ( $\leq -0.75$ ), moderate loss ( $-0.5$  and  $-0.25$ ), or no loss ( $\geq 0$ ) in body condition score in the prepartum period from three dairy herds (excessive loss =  $84.0 \pm 4.1$ ; moderate loss =  $87.8 \pm 3.8$ ; no loss =  $87.8 \pm 3.8$  lb/day). Body condition score change:  $P = 0.07$ ; dairy:  $P = 0.01$ ; and body condition score change  $\times$  dairy:  $P = 0.99$ .

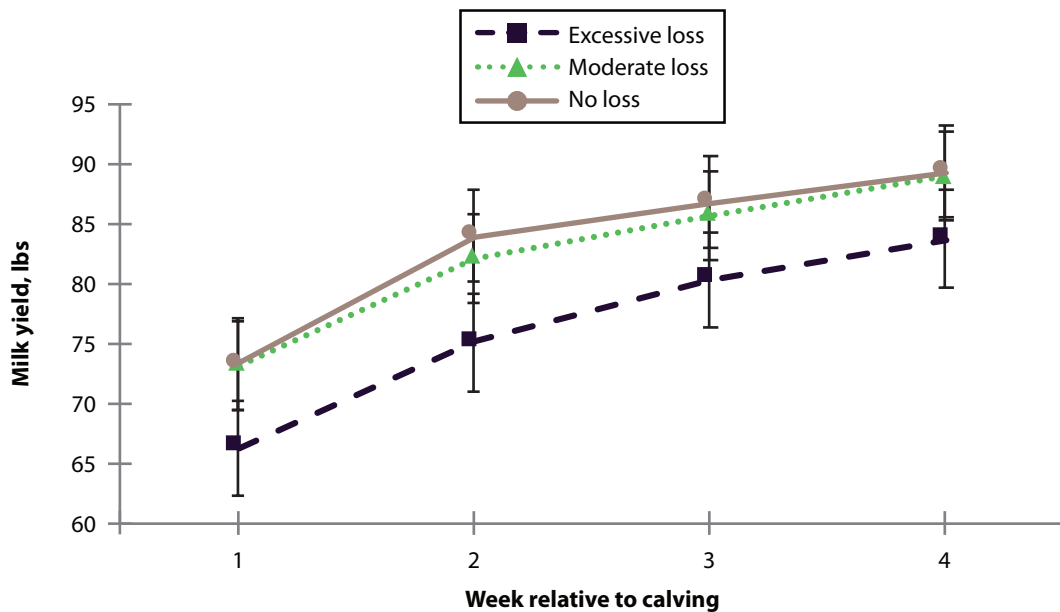
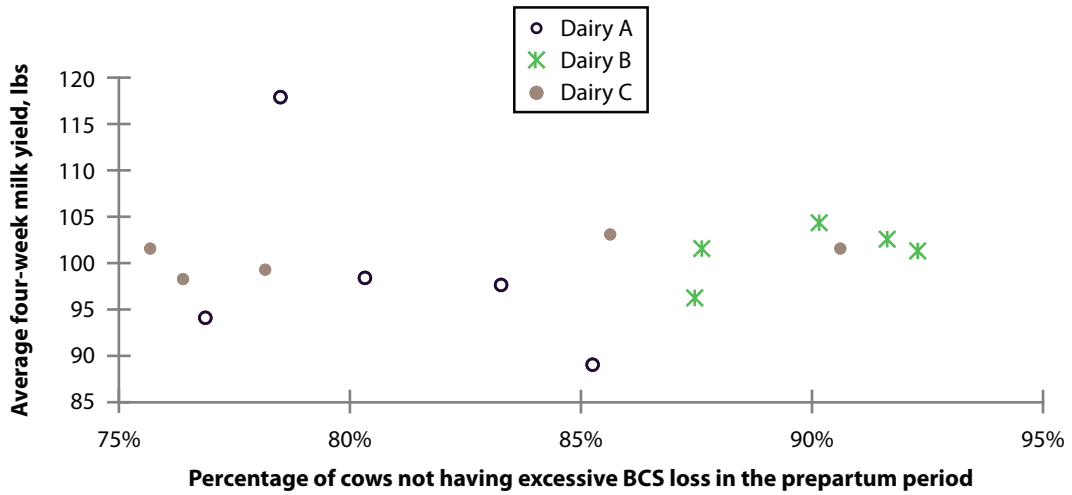
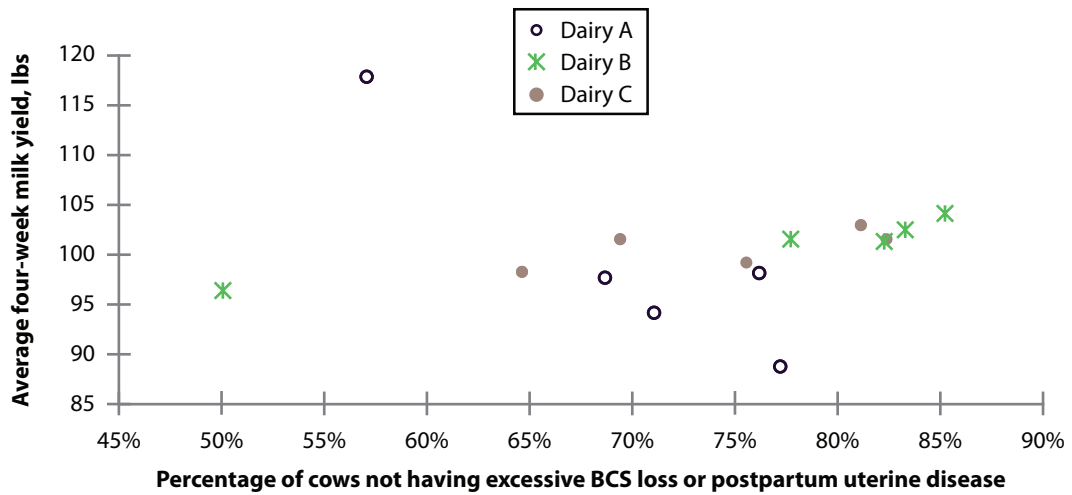


Figure 2. Average milk yield in the first four weeks after calving of cows that had excessive loss ( $\leq -0.75$ ), moderate loss ( $-0.5$  and  $-0.25$ ), or no loss ( $\geq 0$ ) in body condition score in the prepartum period. Body condition score change:  $P < 0.01$ ; week:  $P < 0.01$ ; dairy:  $P = 0.55$ ; body condition score change  $\times$  dairy:  $P = 0.97$ ; body condition score change  $\times$  week:  $P = 0.08$ ; and body condition score change  $\times$  dairy  $\times$  week:  $P = 0.18$ .



**Figure 3. Average week four milk yield and percentage of cows not having excessive body condition score (BCS) loss. Cows calved during a 72-day period. Five groups of cows calved in biweekly periods in each of 3 herds.**



**Figure 4. Average week four milk yield and percentage of cows not having excessive body condition score (BCS) loss or postpartum uterine disorders. Cows calved during a 72-day period. Five groups of cows calved in biweekly periods in each of 3 herds.**