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The long lasting impact of reproductive performance on health and production

by Ricardo C. Chebel, DVM, MPVM
and Luís G. D. Mendonca, DVM
Dept. of Vet. Population Medicine
University of Minnesota

Reproductive performance plays a major role on profitability of dairy herds because of its impacts on average days in milk (DIM), daily milk yield, involuntary culling, and production of replacement heifers. Good reproductive performance, however, also plays a crucial role on health and performance in subsequent lactations.

In a recent study we evaluated body condition score (BCS) at dry-off of approximately 5,000 cows (> 2nd lactation) and over 7,000. BCS is an indirect measure of the amount of fat storage and decreasing BCS represents body weight loss, primarily fat. In Holstein cows, one unit of BCS represents approximately 150 pounds of body weight. In the study mentioned above, cows received a BCS at dry-off and at calving. Their dry periods averaged 54.7 days (range 30 to 90). Cows were then followed during the subsequent lactation when productive, reproductive, and health parameters were evaluated. The majority of cows (over 80 percent) had BCS at dry-off between 3.25 and 3.75 (Figure 1).

The factor that was most important to determine BCS at dry-off was interval from calving to conception, also known as days open. The correlation between days open and BCS at dry-off was positive and linear, indicating that for every 100-day increase in days open beyond 60 days there was a 0.1 increase in BCS at dry-off. Further, there was a positive and linear correlation between DOPN and percentage of cows starting the dry period with BCS over 3.75. As such, for every 10-day increase in days open beyond 60 days there was a one per-



cent increase in the percentage of cows with BCS over 3.75 at dry-off (Figure 2).

We speculate that cows with extended days open spent more days during their lactation in a period of low feed efficiency, characterized by excessive dry matter intake (consequently, excessive energy and protein intake) in relation to their nutrient demands. These cows would then store the surplus nutrients ingested in the form of fat (adipose tissue), resulting in elevated BCS at dry-off.

The importance of BCS at dry-off has been demonstrated before by other researchers. Hayirli et al. (2002) demonstrated that cows that enter the dry period with BCS ~4.25 have smaller dry matter intake (DMI) throughout the dry period compared with cows that enter the dry period with BCS ~2.75 or BCS ~3.5. Further, cows that enter the dry period with BCS ~4.25 have more severe decrease in DMI in the last five days preceding calving.

In our study, we demonstrated that only 24.7 percent of cows entering the dry period with BCS under 3.5 lost BCS during the dry period, whereas 76.6 percent of cows entering the dry period with BCS over 3.75 lost BCS during the dry period (Figure 3).

BCS change during the dry period was 0

for cows entering the dry period with BCS under 3.5, whereas cows entering the dry period with BCS over 3.75 lost 0.28 BCS unit. This indicates that cows that entered the dry period with BCS over 3.75 lost approximately 45 pounds of body weight from the start of the dry period to calving, approximately 0.8 pounds per day during the dry period.

During the dry period cows have significantly smaller nutri-

ent requirements compared to lactating cows because, despite the fact that during the last trimester of gestation there is a significant increase in energy and nutrients requirement for fetus growth, no milk is produced. Therefore, it is expected that during the dry period cows should not lose body weight or body condition score. The transition period, 21 days before and after calving, is a critical period of cows' lives because they transition from a period of reduced nutrient requirements and stress to a period of elevated nutrient requirements and stress associated with calving, changes in diet and grouping, and milk production.

In the last week before calving and in the first 42 days postpartum most cows undergo a period of negative energy balance, characterized by insufficient dry matter intake compared with nutrient requirements for maintenance and fetal growth prepartum, and nutrient requirements for maintenance and milk production postpartum. To meet their nutrient requirements cows then mobilize fat from body storage (adipose tissue), which results in increased circulating concentrations of non-esterified fatty acids (NEFA). Although this is a biologically normal process for most mam-

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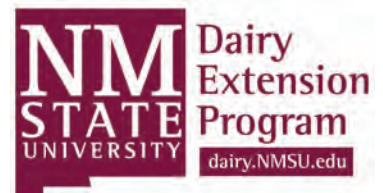
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Long lasting impact . . .

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malian species, in some situations the degree of negative energy balance and the amount of fat mobilized may surpass normalcy and result in metabolic and clinical diseases in postparturient cows.

For example, cows that have concentrations of NEFA over 0.4 mmol/L in the last 7 to 10 days before expected calving date are more likely to have retained placenta, left displacement of the abomasum, be culled within 60 days in milk, and during the first 4 months of lactation produce 2.4 pounds per day less milk. This is clear indication

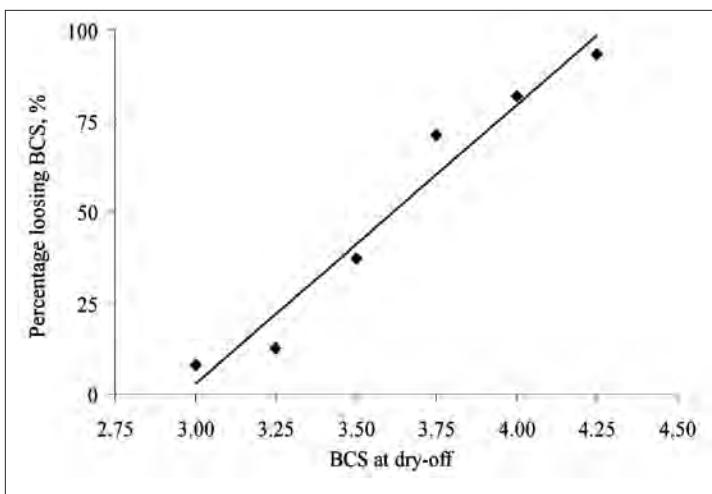


Figure 3: Correlation between body condition score at dry-off and percentage of cows losing BCS during the dry period.

that excessive reduction in dry matter intake and excessive fat mobilization prepartum affect health and productive performances of lactating dairy cows postpartum.

In our study, cows that lost BCS during the dry period were more likely to have retained placenta (5.5 vs. 3.3 percent) and metritis (15.8 vs. 10.9 percent) and were more likely to be culled by 30 DIM (4.8 vs. 2.9 percent) and 60 DIM (7.2 vs. 4.5 percent) compared with cows that did not lose BCS during the dry period. Smaller percentages of cows that lost BCS during the dry period were pregnant by 90 DIM (31.4 vs. 34.5 percent) and 150 DIM (59.2 vs. 63.5 percent) compared with cows that did not lose BCS during the dry period, and the interval from calving to conception was 10 days longer for cows that lost BCS during the dry period (157 days vs. 147 days). Loss of BCS during the dry period also affected milk production during the first 305 days of lactation, because cows that lost BCS during the dry period produced less milk than those that did not lose BCS during the dry period (86.2 vs. 89.1 pounds per day), which would represent approximately 880 pounds less milk during a 305-day lactation.

Other factors affecting BCS change during the dry period

Although BCS score at dry-off was the most important factor affecting BCS change during the dry period, we observed that length of the dry period, incidence of twin pregnancies, and delivery of bull calves also affected BCS change during the dry period. We observed that smaller percentage of cows that spent 50 to 60 days in the dry period lost BCS during the dry peri-

od (37 percent) compared with cows that spent less than 50 days (49 percent) and less than 60 days (54 percent).

In the herd used in this study, cows were fed a far-off diet (low energy and high forage) from dry-off to 21 days before expected calving date, and a close-up diet (high energy and moderate forage) from 21 days before expected calving date to calving. This indicates that herds that use conventional diets in the dry period should carefully monitor reproductive events (i.e. A.I.

date, conception date, abortions, etc.) to avoid maintaining cows in the dry period for shorter or longer periods than the goal.

Another risk factor for BCS loss during the dry period was delivery of twins. Among cows that delivered twins, 61.5 percent lost BCS during the dry period, whereas only 40.7 percent of cows that delivered singletons lost BCS during the dry period. On average, cows that delivered twins lost 0.21 unit of BCS during the dry period compared with 0.09 unit BCS loss of cows that delivered singletons. This means, on average,

that cows delivering twins lost 20 pounds during the dry period (0.4 pounds per day). Further, 44.9 percent of cows that delivered bull calves lost BCS during the dry period (-0.11 on average), whereas only 39.2 percent of cows that delivered female calves lost BCS during the dry period (-0.09 on average).

Management strategy to reduce the risk of BCS loss during the dry period

From the data described above it becomes obvious that poor reproductive performance will have a significant impact on health, production, and reproduction in subsequent lactations. Therefore, reproductive manage-

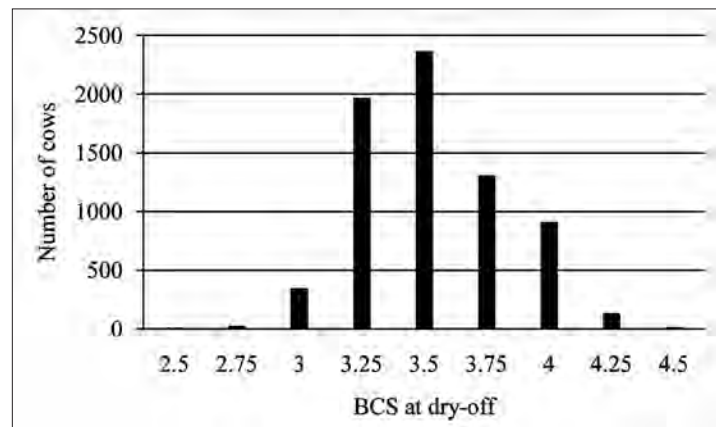


Figure 1: Distribution of body condition scores at dry-off. (Mendonca and Chebel, unpublished).

ment of lactating dairy cows should be aggressive after the end of the voluntary waiting period in order to maximize the number of cows pregnant within 120 days postpartum. In herds with good estrus detection accuracy and efficiency, protocols based on prostaglandin (PG) F2a can be used to synchronize estrus. However, as a safety measure, even herds with good estrus detection should have a timed A.I. protocol for cows that are not observed in estrus and are not inseminated by 90 DIM to assure that all cows are inseminated at least once before 100 DIM.

Herds with reduced estrus detection accuracy and efficiency, however, should have

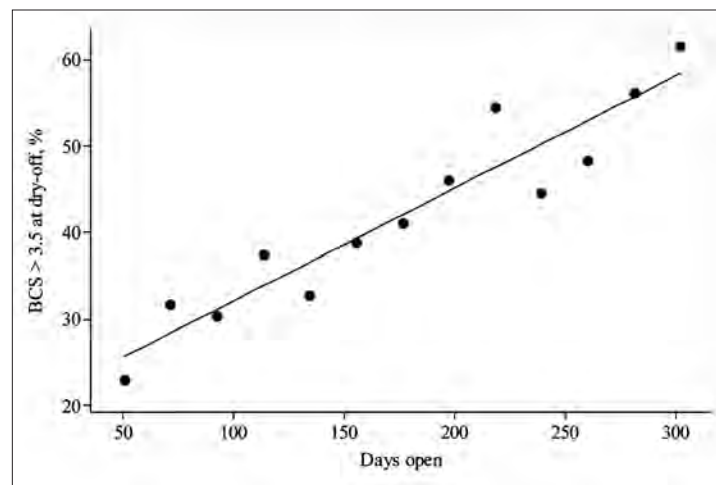


Figure 2: Correlation between interval from calving to conception (days open) and percentage of cows with body condition score > 3.5 at dry-off. Cows with BCS > 3.5 at dry-off = $19.1 + 0.1 \times \text{DOPN}$ ($r^2 = 88.3\%$).

in place presynchronization and synchronization strategies that will assure insemination of all cows within the first 80 DIM, which would then allow for a second insemination of non-pregnancy cows by no later than 120 to 130 DIM.

Summary

To assure that dry cows do not lose BCS during the dry period dairies should always provide feed of good quality with consistency in ingredients and time of feeding, there should always be feed available to dry cows for ad-libitum consumption, they should limit the number of days in the dry period to 50 to 60 when adopting conventional feeding strategy for dry cows, stocking density should be managed closely to avoid overcrowding (100 percent during the far-off period and 90 percent during the close-up period), and when possible springer heifers should be separated from cows to avoid deleterious social interactions.

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For further information contact:
Dr. Ragan Adams, Editor
ILM, CSU-VTH
300 W. Drake Road
Fort Collins, CO 80523
970-297-0371
radams@lamar.colostate.edu

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