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First-calf heifers have unique dietary needs

Bottom Line

with
AL KERTZ*

THE focus of this column is on calves and heifers. Some may think that it has been heavy on the calf end, and they may be right since that is such a critical phase. So, let's look at the far end of the heifer side, even into their first lactation. The reason for this look is because there are some unique aspects of first-calf heifers that differentiate them from later-lactation cows.

First, dry matter intake (DMI) differs prior to calving (Figure 1, 2001 dairy National Research Council) during the transition period by being lower as a percentage of bodyweight, by maintaining its level of DMI longer prior to calving and then by falling off more rapidly right before calving than for older cows.

These differences (Kertz et al., 1991) continued post-calving, as seen in Figure 2. DMI followed a similar pattern for both first- and later-lactation cows, but with a slower rate of increase for first lactation until week 5. After week 5, first-lactation DMI averaged about 15% less than for older cows.

Bodyweight loss was greater for older cows and reached a low at weeks 5-7. Bodyweight then progressively increased until week 19. By contrast, first-lactation cows reached their low bodyweight at week 4 and stayed at that level until week 12, except for a two-week increase coinciding with the end of the first data set and the beginning of the second data set from this overall data set.

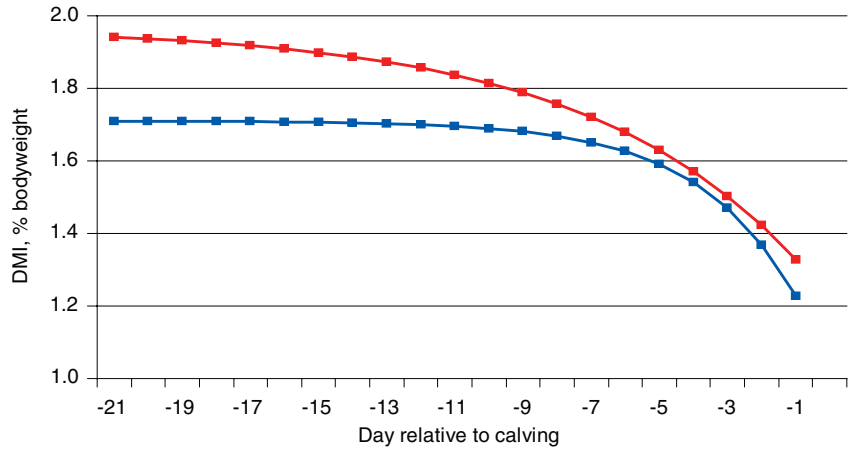
Body condition scores were not available from all studies in this data set, so bodyweights were used and summarized. A limitation of bodyweight is that it is not possible to distinguish between loss of body condition and the effect of increasing rumen fill or volume as DMI increases.

These differences were evident for lactation curves. Note in Figure 3 that milk production of all later-lactation cows peaked higher and sooner and then declined more rapidly than first-lactation cows. During the first week of lactation, first-lactation milk yield was only 72% of older cows' milk, increased by one percentage unit each week until week 9, leveled off at about 81% for weeks 9-14, increased to 83% for weeks 14-17 and then increased from 83 to 88% by week 20.

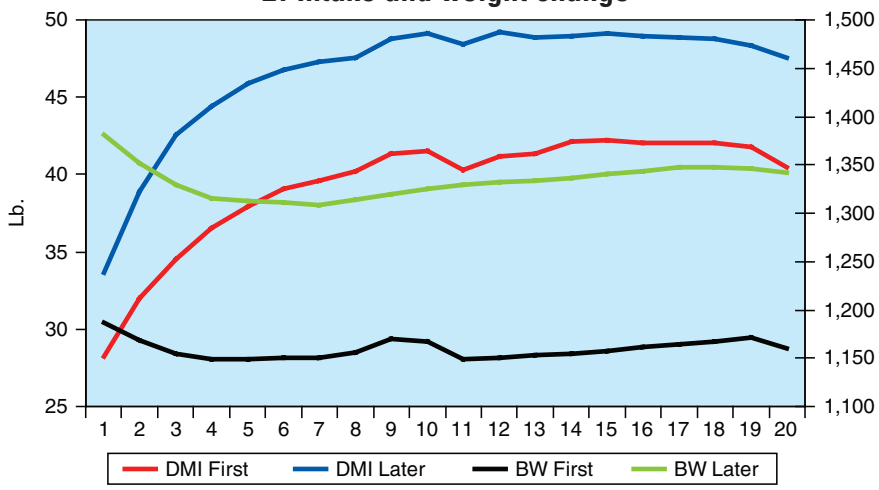
Generally, total first-lactation milk production is about 75-85% of later lactation yields. After reaching peak yield, milk production declines were only at about 4-6% per week for first-lactation cows compared to 8-10% per week for older cows. The reason 4% fat-corrected milk (FCM) production was flatter for both first and older cows was because

*Dr. Al Kertz is a board-certified, independent dairy nutrition consultant based out of St. Louis, Mo. His area of specialty is dairy calf and heifer nutrition and management. To expedite answers to questions concerning this article, please direct inquiries to *Feedstuffs*, Bottom Line of Nutrition, 12400 Whitewater Dr., Suite 160, Minnetonka, Minn. 55343, or e-mail comments@feedstuffs.com.

1. Heifer versus cow



2. Intake and weight change



of the inverse relationship between milk fat percentage and milk production yield, especially in earlier lactation. Thus, the daily yield of fat and FCM is flatter until milk production itself begins to decline more.

Calculating energy balance (total digestible nutrients) in this data set resulted in Figure 4. Older cows experienced an energy deficit in early lactation up to week 15, and this was about 19% of the total energy requirement at its greatest. In contrast, first-lactation energy intake equaled the requirement at week 13, maximum deficit was at week 9 (only 5% of requirement) and magnitude of energy deficit was less than for older cows on both an absolute and a relative basis. This most likely reflects growth requirements and priority for first-lactation cows as another data set indicated that an additional 12% increase in bodyweight (Kertz et al., 1997) occurred between the first and second calvings.

DCAD rations

Should first-calf heifers be fed dietary cation-anion difference (DCAD) rations prepartum to minimize milk fever or hypocalcemia? A study (Moore et al., 2000) to assess this was done at Michigan State University with 21 Holstein cows and 34 first-calf heifers. They were fed during the last 24 days before calving one of three diets with DCAD of 15 meq/100 g dry matter (DM) for the control and 0 meq/100g or -15 meq/100g for treatments.

Total mixed ration diets contained corn silage and alfalfa haylage at 55% of DMI with 16.5% protein. After calving, all cows and heifers were fed the same lactation total mixed ration for 10 weeks. Cows increased milk production with more negative DCAD treatments, but heifers' milk production did not differ by treatments. Heifers' DMI decreased for both DCAD treatments, but only with the -15 DCAD diet for cows.

Plasma ionized calcium was low and increased for cows with treatments but was similar among heifer diets while also being higher than cow plasma levels. DCAD treatments increased liver fat content for heifers while decreasing liver fat for cows. Non-esterified fatty acid levels had a similar pattern to liver fat content.

So, there was no benefit and some negatives in DMI, milk production and liver fat by using more negative DCAD prepartum diets for heifers. Not feeding a DCAD ration to heifers, if being fed to cows, can complicate feeding programs for the dry and close-up periods. However, this study indicates that heifers have a negative response to DCAD rations and are not likely to benefit anyway as they are less susceptible to lower plasma calcium levels and related conditions.

Dry period length

Most recently, studies (Figures 5 and 6, page 15, courtesy of Robin Rastani) have been done in which dry period lengths have been reduced from 60 days to 30 days or to even no dry period (Rastani et al., 2005). Decreased milk production in the lactation following a 30-day dry period ranged from none to 10% less. This reduction was even greater for first-lactation heifers than for older cows (11 versus 5%) and even more reduced for no dry period (35 versus 14%).

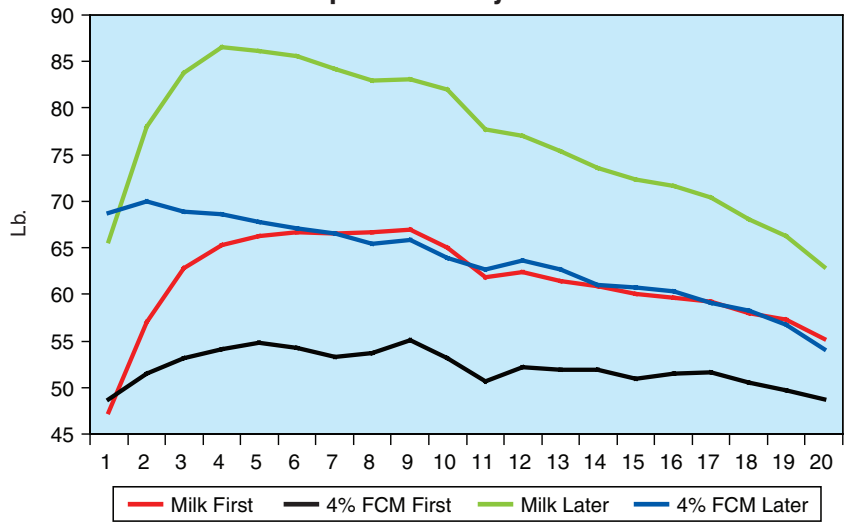
First-calf heifers are more likely to be low in the social order, especially early in lactation as they contend with larger and more-dominant cows. Grant and Albright (2001) established that separating first-calf heifers from older cows had the following effects: 11.4% more eating time, 8.5% more meals per day, 11.8% more silage DMI, 8.8% more lying time, 19% more lying periods per day and 3.5 lb. more daily milk production over the first 130 days in lactation.

With all of these challenges for first-calf heifers, it behooves us to grow and develop them most appropriately to reach their genetic potential and to be able to function best when lactation ensues.

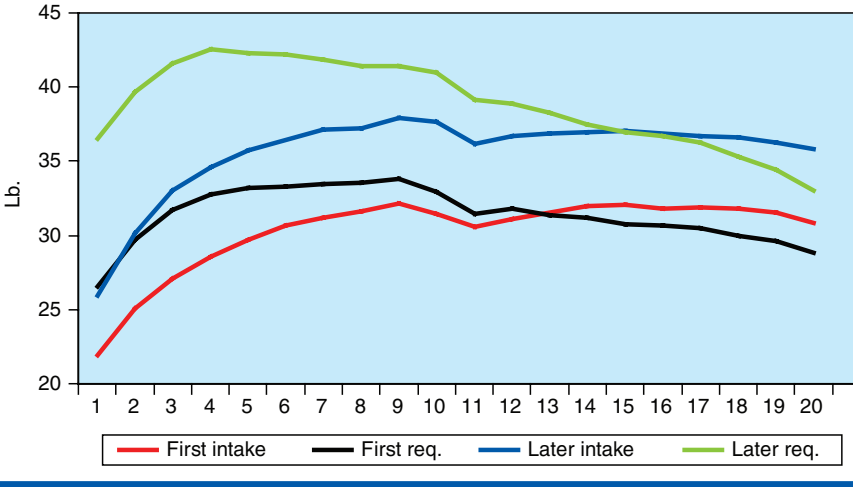
The Bottom Line

Heifers need dry period attention. DCAD is not beneficial and may be negative. Heifers do not decrease as much in DMI prior to calving as cows do, but their decrease in DMI is more pronounced at the very end of this transition period. Heifers have very different lactation profiles being lower and slower in DMI increase, lower and slower in milk production increase and have less energy deficit but with more growth than older

3. Milk production by lactation



4. Energy deficit by lactation



cows.

Separate heifer groupings have advantages. Heifers typically have the best genetics in a herd, so let's do a better job in growing and developing them to more nearly reach that potential. Review production records by lactation number to see what pattern exists and to see if heifers are doing poorer in mature equivalent milk but are higher in genetic potential. If so, then review the heifer growing program by segments, identify the problem areas and correct them.

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5. Lactation number effect, milk production with shortened dry periods