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Criticality of transition period for young calves often unrecognized

BY AL KERTZ

With good reasons, we have become increasingly oriented toward the transition period for dairy cows — the two weeks prior to and two weeks after calving. We know that how cows are fed and managed during this period will help minimize problems and maximize production during the ensuing lactation.

There is an analogous transition period for the calf: the two weeks prior to and two weeks after weaning.

There are three phases most critical for young calves. The first is at birth, which includes the conditions for birth along with how colostrum quality, quantity and administration are managed.

This largely determines how the calf will fare during the next critical phase, the first two weeks of life. During this time, the calf relies on the antibody protection it received from colostrum until it begins to produce its own antibodies in the following week or so (Warner and Brownstein, 1976). It is during this two-week period that most calf mortality occurs as well as the major incidences of scouring and poor health. The major emphasis should be on keeping the calf alive, healthy and growing. When a calf gets beyond this phase, it is not home free, but it has survived the first two critical phases.

That leaves the third phase, largely unrecognized for its criticality and consequences — the transition period around weaning.

Transition

When a calf is born, it is a non-functional ruminant (for a succinct and very readable synopsis of the development of a functional ruminant, see Warner, 1991). The rumen does have an inherent ability to develop volumetrically, but it is the nature of the diet and functioning that are most critical. The key to that development is the volatile fatty acids (VFA) produced by the type of substrates and conditions of the fermentation.

While hay may lead to desirable weight gains at a young age, it is a distortion because gut fill increases as hay intake increases. That's because, in the early stage of rumen development, hay has a slower rate of fermentability, a low extent of digestibility and is bulky. Furthermore, fermentation end products stimulate rumen papillary proliferation in the descending order of butyrate, propionate and acetate as long as acidosis is not created. Warner (1991) estimated, based on some earlier work, that rumen papillae can decrease or increase in size in young calves within 16-23 days.

With the above as background, let's look at what happens around weaning.

A largely unheralded study (Quigley et al., 1985) evaluated effects of weaning at four or eight weeks of age (WOA). Calves were open bucket-fed 2 qt. of saleable or waste milk twice daily except during the last week, when milk was gradually reduced to zero by the end of the week.

Starters were either complete, pelleted and fed alone or unpelleted starter fed with a second-cut mixed alfalfa-grass hay. Dry feeds were fed ad libitum *beginning at 5-10 days of age along with water and salt. At one week of age, Holstein bull calves were cannulated in the rumen and abomasum. Data are for the complete pelleted diet, as this treatment is not confounded by meal form of the starter and forage being fed.*

Starter intake during the first four weeks was greater for calves weaned at four weeks than weaning at eight weeks because, as weaning proceeded during the last week, starter intake increased as a consequence. Starter intake continued to be greater during weeks five to eight for the four WOA weaning treatment with an apparent carryover effect even during weeks 9-11. Growth was not affected by treatment and averaged 0.31, 1.23, and 1.76 lb. per day for ages two to four, five to eight and 9-11 weeks, respectively.

The substitution effect was 2.9 lb. less starter intake for each additional pound of dry matter from milk compared to 2 lb. less starter intake per pound of dry matter intake from milk replacer when weaned at four or six WOA (Kertz, 1987). In the latter study, milk replacer had 12% fat. That would reduce starter intake proportionally less than whole milk with its higher fat content.

Two indices were used to measure rumen function. The first was VFA concentration in rumen fluid, and the second was the percentage of total nitrogen outflow from bacterial nitrogen into the abomasum from the rumen.

Rumen VFA concentration increased faster when calves were weaned at four WOA compared to eight WOA, and plateaued at six weeks — two weeks after weaning. When calves were weaned at eight WOA, VFA concentration plateaued about two weeks after weaning also. Granted, there is some variability in these data, but considering they came from four calves per treatment, it is a pretty good picture of the influence of starter intake on rumen fermentation as evidenced in VFA concentration.

Data appear more variable by two-week periods than the VFA data, especially for eight WOA at weaning. In particular, the two-week data of more than 50% of total nitrogen from bacterial nitrogen appears spurious. For four WOA at weaning, the bacterial nitrogen contribution essentially peaked one week after weaning, while it does not appear to peak until two to three weeks (10-12 weeks WOA) after weaning for the eight WOA at weaning treat-

■ *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.*

ment.

If 50-60% of total nitrogen from bacterial nitrogen is used as a good indicator of more "mature" rumen function, then this parameter appears to have been achieved several weeks after weaning. The high 60-80% of total nitrogen from bacterial nitrogen at 7, 9, 10 and 11 weeks for eight WOA at weaning must be somewhat characteristic of the calves on that treatment as it is not consistent with the lower level of starter intake on that treatment, although this treatment also had higher rumen VFA concentrations in weeks 10-11.

In the four WOA weaning data (Kertz et al., 1979), starter intake essentially doubled each week from weeks one to four. During the third week, starter intake averaged the proverbial 1 lb. per day (often used as the key parameter that calves are ready to begin the weaning process), which doubled again during the fourth week when one of the two milk replacer feedings was eliminated.

Thus, the two weeks before full weaning have had adequate starter intake for rumen papillary development as indicated by Warner (1991). Starter intake after complete weaning should continue to increase 50% the first week and then by another pound or more each week after that. This provides ample time for optimal rumen function and papillary development — unless hay is being fed.

For a good visual picture of the negative effect when hay is fed during this time period, see Heinrichs (1999).

*There are a number of practical feeding and management implications to this calf transition period. As indicated in the September 2001 column, most calves are not weaned until eight WOA or later. Then, they are also exposed to a number of other changes at or near the same time, such as being moved from a hutch to a group, changed diet, administered shots or other treatments, etc. This is the first time they should get forage. However, if they have just been weaned, they do not have adequate rumen function and development yet. So, now the calves experience a lot of stress and often have major respiratory problems that can impair them for life (*Feedstuffs, *Sept. 10, 2001).*

It is my personal observation that the later calves are weaned, the more likely they are to incur this stress and these problems. If calves are typically moved from a hutch to a group at two months of age, move back the weaning age at least two weeks to allow for starter intake to help rumen function and papillary development to the point that this should not then be one of the major stressors. If calves are weaned early at four WOA — and the calves are doing well — do not move them to a group and onto forage at the end of six WOA as they will not yet be able to handle this without problems.

The Bottom Line

The calf transition period can help or hurt calves depending on how it is managed. This is largely due to changes and age at weaning, the quality and intake of the starter and the functional development of the rumen. The key is to make this a positive change rather than contribute to ensuing problems.

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