Hay, hulls in calf starters troubling

In my November column (Kertz, 2008a), concerns were expressed about the state of many calf starters. Consequently, this column will address issues related to calf starters containing either cottonseed hulls (CSH) or hay.

While there are clear data about the negative effects on rumen development of using hay in calf starters before and somewhat after weaning (Warner et al., 1991), most U.S. dairy producers begin feeding hay to calves at an average age of about 24 days (National Animal Health Monitoring System, 2007).

A recent study by Hill et al. (2008) provides the basis for evaluating the effect of using CSH or hay in calf starters. A series of four trials were done using 48 purchased bull calves with an average age of three to five days and weighing 92 lb. for the first three trials. The fourth trial used 58- to 60-day-old calves weighing an average of 154 lb. All calves were maintained in four pens of six calves each per treatment and were fed starter and water free choice.

The texturized calf starter control (87.2% dry matter) in the first three trials was similar in particle size to the starter used by Porter et al. (2007); it contained 40% corn and 25% oats and averaged 18.1% CP, 5.7% ADF and 14.3% neutral detergent fiber (NDF) on a dry matter basis.

The CSH averaged 90% dry matter and 3.4% CP, 57.3% ADF and 79.2% NDF on an as-fed basis.

The hay was mostly mixed timothy grass and averaged 89.8% dry matter, 14.2% CP, 29.5% ADF and 46.6% NDF on an as-fed basis.

As CSH or hay were added to the control calf starter diet to form the various other diets, this tended to decrease CP while increasing ADF/NDF intake in a dilution effect.

Feed efficiencies showed any diet effects. Feed efficiencies increased, minimal increase or loss of ADG with an accompanying apparent large increase in trying to measure or discount any postweaning response. This postweaning bodyweight response can often be quite variable as calves increase or decrease intake as calves increase or decrease bodyweights to complete the picture. It is always good to have postweaning bodyweights to complete the picture in trying to measure or discount any postweaning response. This postweaning response can often be quite variable as calves increase or decrease intake with an accompanying apparent large increase, minimal increase or loss of bodyweight (Kertz, 2007).

Hip widths (data not shown) did not show any diet effects. Feed efficiencies did not show any differences except for ADG and EBWADG both decreased.

During days 56-84 (5% hay was added to both the control and 5% CSH calf starters), call starter intake decreased (P < 0.08), and so did EBWADG, but not ADG. This indicated that rumen fill was increasing with the hay addition but that calves could not maintain their intake enough to prevent a loss in EBWADG. This was reflected in the much greater (P < 0.01-0.03) NDF intake limiting total intake while creating rumen fill.

In trial 2, the addition of 5% or 10% CSH or 5% hay decreased ADG (P < 0.02-0.10) and calf starter intake (P < 0.04-0.07) linearly across time periods before (1-28 days) and after weaning (28-56 days and 56-84 days; Table).

It is always good to have postweaning bodyweights to complete the picture in trying to measure or discount any postweaning response. This postweaning response can often be quite variable as calves increase or decrease intake with an accompanying apparent large increase, minimal increase or loss of bodyweight (Kertz, 2007).

Performance of calves in trial 2

<table>
<thead>
<tr>
<th>Days 1-28</th>
<th>Days 28-56</th>
<th>Days 56-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial bodyweight, lb.</td>
<td>91.8</td>
<td>95.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days 1-28</th>
<th>Days 28-56</th>
<th>Days 56-84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calf starter intake, lb. per day</td>
<td>2.68</td>
<td>2.69</td>
</tr>
</tbody>
</table>

| Ratio of ADG to milk replacer and calf starter intake |
| Days 1-28 | 0.551 | 0.497 | 0.494 | 0.518 | 0.16 |
| Days 28-56 | 0.382 | 0.392 | 0.370 | 0.382 | 0.53 |
| Days 56-84 | 0.346 | 0.359 | 0.339 | 0.380 | 0.35 |

greater efficiencies (P < 0.04) for days 28-56, which were the four weeks after weaning but before calves went into groups of six for days 56-84.

With young calves, efficiencies can be problematic to calculate. First, this efficiency is a ratio of numerators and denominators that are each smaller numbers with considerable variation.

Next, what do you do about milk replacer intake before weaning? Milk replacer composition is distinctly different in nutrient composition, source of nutrients and site of digestion than calf starters. However, if you do not include milk replacer intakes before calves are weaned, how meaningful would efficiencies be?

Since milk replacer intakes were identical across treatments, it can be argued that adding this constant across treatments does not affect efficiencies unless starter intakes are different. However, adding milk replacer intake does affect the efficiency ratio since it changes the denominator.

In trial 3, calf starter contained 0%, 2.5% or 5% hay for the 56-day study. The use of hay rather than CSH, as in trials 1 and 2, accentuated differences so that ADG, EBWADG, calf starter intake, efficiencies and hip width change declined linearly (P < 0.05) with increasing hay.

In trial 4, calf starters contained either 5% or 15% hay for the period after weaning of 56-84 days. ADG, EBWADG, calf starter intake and NDF intake were reduced by hay inclusion (P < 0.05). The 15% hay treatment reduced ADG by 12% — from 2.27 lb. to 2.00 lb. — versus the 5% hay diet.

So, what does this all mean in the context of other studies? One potential confounding element in this trial is that calves were bedded on straw. Almost none of the 1950s, 1960s and 1970s calf trials on rumen development and rumen function (Kertz, 2008b) used any bedding so as to avoid this confounding element.

In 2007, all four calf trials related to calf starters published in the Journal of Dairy Science used bedding. From those early calf trials and this study, it is evident that hay has a very negative effect on rumen development, fill and function.

Why is CSH used considerably in some parts of the U.S. for calf starters? I think it is because the hulls are considered to be “safe.” While they may limit marginal calf ruminal acidosis and thus are safe, I know of no data that show what effect CSH may have on development of rumen function. Since the hulls have low fermentability and digestibility, they most likely contribute little, if any, to rumen papillae development. If so, then calves would struggle more when they go off a calf starter that contained CSH to diets with forage because rumen development would have been limited.

Also, false growth may occur since greater rumen fill was noted in this study when EBWADG was calculated rather than just ADG.

The Bottom Line
This study confirmed limitations with calf starters using CSH and/or hay since they contribute to greater rumen fill, even if daily gains and bodyweights do not reflect this.

References