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Negative digestibility effects of high milk feeding discussed

Bottom Line

with
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THE advent of increased feeding of milk or milk replacer to dairy calves began with studies published since 2000 that were done primarily at Cornell University, the University of Illinois and Michigan State University (Kertz et al., 2017).

This greater feeding level has become more accepted, as evidenced by the 2014 National Animal Health Monitoring System (NAHMS) study data shown in Table 1. Almost 25% of farms fed six quarts or more each day instead of the more traditional four quarts daily (Kertz et al., 1979) — a 50% increase. The average age at weaning also increased from eight weeks to nine weeks from the 2007 to the 2014 NAHMS reports.

That increased feeding is good news, but there is another side of the equation.

Gelsinger et al. (2012) found an inverse relationship between milk/milk replacer dry matter intake (DMI) and calf starter DMI in a meta-analysis of 21 treatments from nine individual calf studies (Figure). This means that as more milk/milk replacer is fed, the weaning transition (two weeks before to two weeks after full weaning) may become more difficult. When that transition is difficult, calves may stall out, regress and be stressed, which may increase their likelihood of having a respiratory problem that impairs them for life. So, is there a happy medium?

First, let's consider what an accepted objective is for calves in their first two months of life. In the Dairy Calf & Heifer Assn.'s Gold Standards, the objective is to double a calf's birth weight by the end of two months of life. The average birth weight of Holstein heifer calves is about 93 lb., depending on the parity and genetics of the dam (Kertz et al., 1997). Doubling that birth weight in 60 days would require 1.55 lb. of average daily gain (ADG).

Two studies were published by Provimi Nurture Research in Ohio that relate to the Figure. Both followed a similar protocol in purchasing 48 male Holstein calves from a large dairy.

In the first study (Hill et al., 2016a), a milk replacer containing 27% crude protein and 17% fat was fed as a control, with 1.54 lb. fed daily in two separate feedings in 13% solids for 49 days before abrupt weaning. An aggressive treatment was fed for four days at 1.54 lb., for four days at 2.11 lb. and then for 34 days at 2.88 lb., followed by 1.54 lb. for the last seven days before weaning at 49 days. Solids level was 15% for the first 42 days and 13% for the last seven days. A 20% crude protein, well-texturized starter (37% whole shelled corn and 25% whole oats) was fed free choice, along with water. Also, within each treatment was a "with" and "without" package of functional nutrients.

After 56 days, calves were grouped into pens of four animals — consistent with their same previous treatments — for another 56 days. The same texturized starter was fed but mixed with 5% chopped grass hay.

In the second study (Hill et al., 2016b), a similar texturized starter was fed as in the first study, but the milk replacer fed contained 28% crude protein and 20% fat. The milk replacer treatments were:

- Moderate control — 1.54 lb. daily for 39 days and then 0.72 lb. for three days before weaning;
- Moderately higher — 1.94 lb. for five days, 2.42 lb. for 23 days, 1.94 lb. for 18 days and then 0.72 lb. for three days before weaning, and
- Highest — 1.94 lb. for five days, 2.42 lb. for 37 days and then 1.23 lb. for seven days before weaning.

After 56 days, calves were grouped and fed like the first study using the texturized starter blended with 5% chopped grass hay.

In the first study, calves ate less starter in the first 56 days when fed more milk replacer, as expected, but they also gained more weight (Table 2). Digestibility was measured at three times for days 19-23, 40-44 and 52-56 using chromic oxide. HOWEVER, in periods when calves were consuming both milk replacer and starter, overall digestibility was somewhat confounded by differing digestibilities of about 95% for milk replacer and about 75% for starter. Consequently, digestibil-

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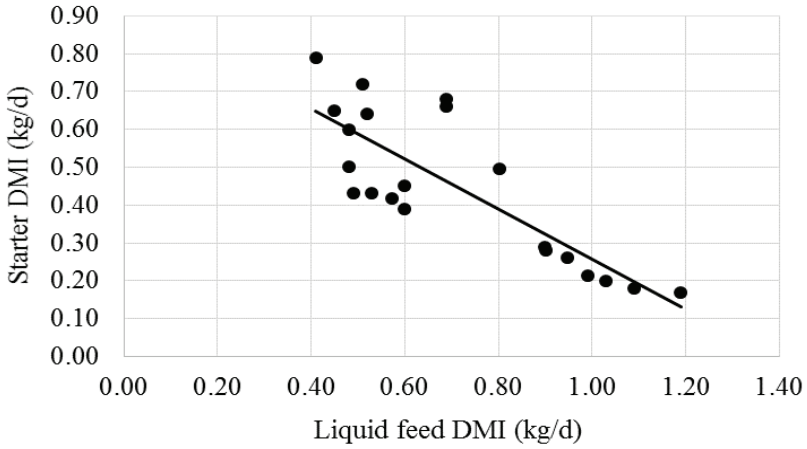
Relationship between milk/milk replacer DMI and calf starter DMI



Y = -0.66x + 0.92 r = -0.82. Thus, for each 100 g increase in daily liquid DMI, starter intake decreased 66 g.

Source: Gelsinger et al., 2012.

1. Quarts of milk or milk replacer fed per calf daily as % of operations by number of cows on farm (NAHMS, 2014)

Quarts fed	Dairy farm size (number of cows) Small (<100)	Medium (100-499)	Large (500+)
<4	2.4	3.6	3.2
4-6	57.0	48.4	34.6
6-7	23.0	24.2	23.5
8-9	6.5	18.4	27.2
10+	5.7	5.4	11.5

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ity data in Table 2 represent days 52-56, when calves were consuming only starter.

Calves did double their bodyweight on the high milk replacer feeding level, but there was a negative carryover effect on reduced dry matter and lower neutral detergent fiber (NDF) and acid detergent fiber (ADF) digestibilities. During the next 56-day period, those calves gained 0.11 lb. less daily, ate 0.53 lb. less dry matter daily and had 12% lower feed efficiency.

In the second study, even calves on the moderate-fed milk replacer treatment nearly doubled their birth weight at the end of the first 56-day trial period (Table 3). During the second 56 days, contrasts were greatest between the moderate and high treatments. Dry matter, NDF and ADF digestibilities were lower at 11 weeks for the high versus moderate treatments, and the difference decreased for dry matter — but not for NDF and ADF digestibilities — at 16 weeks.

So, why were there carryover effects for high versus more moderate milk replacer feeding levels on intake, ADG and various digestibilities when starter intake was lower after calves were weaned?

I think it may have been simply because starter intake was not adequate for two to three weeks before calves were weaned. The lower NDF and ADF digestibilities most likely reflect poorer rumen function and development, as noted by Porter et al. (2007), when comparing all pelleted versus texturized starters. Also, remember, in these two Hill et al. studies, texturized starters were fed; the results may have been even poorer with pelleted starters.

The Bottom Line

Calves fed higher levels of milk replacers did gain more before weaning, but there were negative carryover effects on intake, feed efficiency and digestibility, especially for dry matter, NDF and ADF. This was most likely due to not enough time and higher starter intakes for better rumen development and function. In these studies, texturized starters were fed, and the results may have been poorer if not for that.

2. Data from Hill et al. (2016a) study with two different milk replacer feeding levels

	Moderate	High
Milk replacer intake, lb./day	1.28	2.29
Starter intake, lb./day	1.23	0.90
ADG, lb.	1.21	1.74
Digestibility, %		
Dry matter	77.8	72.5
Starch	98.0	97.3
NDF	33.3	11.8
ADF	23.0	9.5

3. Data from Hill et al. (2016b) study with three milk replacer feeding levels for two 56-day feeding periods

Feeding period	Moderate	High-moderate	High
1-56 days			
Milk replacer intake, lb./day	1.01	1.67	1.92
Starter intake, lb./day	2.14	1.39	1.10
ADG, lb.	1.54	1.59	1.70
57-12 days			
DMI, lb./day	6.32	6.23	6.52
ADG, lb.	2.44	2.40	2.35
ADG/DMI	0.34	0.33	0.31

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