Feedstuffs, September 9, 2013 **Feedstuffs** Reprint

Pelleted versus texturized calf starters

READERS of this column know of my preference for well-texturized versus all-pelleted calf starters, based on research trial data, field experiences and the biology involved.

In this area, I question what the data tell us and how they are interpreted.

There is a body of more recently published studies in which all-pelleted calf starters are used. These studies were mostly conducted by Alex Bach of IRTA in Spain. While we have frequent discussions on this topic, we tend to disagree — albeit in a civil, spirited and at times humorous manner.

My critique of a recent publication on whether preweaned and weaned calves need high fiber content or a forage source (Terre et al., 2013) was in that spirit also.

Sixty-three male Holstein calves averaged 9 ± 4.4 days of age and 95.6 ± 9.9 lb. and were randomly distributed according to bodyweight and age into four treatments: a low-fiber pelleted starter (18% neutral detergent fiber [NDF]) with or without chopped oat hay in separate buckets and a high-fiber pelleted starter (27% NDF) with or without oat hay in separate buckets.

The particle size distribution of the chopped oat hay was as follows: 38.3% were larger than 20 mm, 49.2% were between 8 mm and 20 mm and 12.5% were smaller than 8 mm.

The low-NDF pelleted starter contained 22.0% wheat, 24.0% corn, 11.2% barley, 24.0% soybean meal (44% crude protein), 5.0% wheat midds, 5.0% soybean hulls and 1.8% minerals/premix with 22% crude protein, 18.2% NDF, 7.2% acid detergent fiber, 43.7% starch, 4.2% ether extract and 5.7% ash on a 100% dry matter basis.

The high-NDF pelleted starter contained 32.6% wheat, 8.0% corn, 4.0% barley, 22.2% soybean meal-44, 2.0% wheat midds, 29.4% soybean hulls and 1.8% minerals/premix with 23.5% crude protein, 26.7% NDF, 13.6% acid detergent fiber, 34.3% starch, 4.9% ether extract and 5.8% ash.

Water, pelleted starter and hay were offered free choice. A 25% crude protein/19.2% milk replacer was fed at the rate of two liters twice daily for the first six days until reaching 15% dry matter on day 7. Then, calves were fed four liters per day until 34 days, after which calves only received the morning feeding until they were weaned at 43 days. The study ended at 55 days, when calves averaged 64 ± 4.9 days of age.

Calves were housed in individual sawdust-bedded pens of 5.25 x 3.28 ft., or 17.2 sq. ft. This is less than the Dairy Calf & Heifer Assn.'s Gold Standards III recommendation of at least 24 sq. ft. of resting space.

Once weekly for two weeks both before and after weaning, six animals per treatment were randomly observed for an hour both before and after eating solid feed. The total observation time per animal was eight hours.

The low-NDF starter had a high level of starch at 43.7%, while the high-NDF starter had less starch at 34.4%. It could be argued that the treatments should have been labeled as high and "lower" starch.

When both of these starters were fed alone, calves had a low rumen pH of 5.0 and 5.1, respectively (Table), along with considerably greater total volatile fatty acids (VFAs), a lesser molar percentage of acetate but greater molar percentages of both propionate and butyrate compared to these two starters when fed with hay. These values, especially for rumen pH, are characteristic of marginal rumen acidosis because of both the level and fermentability of starch.

With all-pelleted starters, there is no particle size to stimulate rumination. Thus, the provision of hay eliminated this acidosis, as reflected in a rumen pH of 5.9 and 5.7, respectively, for the low-NDF with hay and high-NDF with hay

Bottom Line

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Summary of results of Terre et al. (2013) study

	----Low NDF----		----High NDF----		Std. error	---P-value---	
Item	No hay	With hay	No hay	With hay	of means	NDF	Hay
9-51 days of age (weeks 1-6)							
Final bodyweight, lb.	158.1	161.2	153.9	155.0	1.92	0.058	—
ADG, lb./day	1.50	1.54	1.39	1.41	0.06	—	—
Starter DMI, lb./day	1.21	1.17	1.12	1.17	0.10	—	—
Hay DMI, lb./day	—	0.07	—	0.05	0.01	—	—
Gain:feed	0.61	0.63	0.60	0.56	0.013	0.006	—
52-64 days of age (weeks 7-8)							
Final bodyweight, lb.	185.0	195.1	181.9	187.2	3.46	0.091	0.058
ADG, lb./day	1.89	2.47	2.00	2.27	0.13	—	0.003
Starter DMI, lb./day	4.45	5.06	4.51	4.93	0.21	—	0.014
Hay DMI, lb./day	—	0.21	—	0.16	0.04	—	—
Gain:feed	0.42	0.43	0.41	0.45	0.02	—	—
Time spent (minutes/day):							
Lying	287	222	292	232	2.4	—	0.05
Ruminating	20	61	9	55	3.1	—	0.001
Abnormal behaviors	13	3	17	6	1.9	—	0.022
Metabolic parameters							
Insulin, µg/L	0.43	0.59	0.32	0.55	0.187	—	0.027
Insulin:glucose	4.64	6.79	3.88	6.29	0.18	—	0.017
Rumen pH	5.0	5.9	5.1	5.7	0.09	—	<0.001
Total VFAs, mM	202.8	123.8	214.9	148.3	8.65	—	<0.001
Acetate mol/100 mol	43.6	45.0	44.6	47.4	0.91	0.069	0.028
Propionate, mol/100 mol	36.2	40.5	32.7	38.1	1.37	0.032	<0.001
Butyrate, mol/100 mol	14.1	9.8	14.9	9.4	1.08	—	<0.001
Acetate/propionate	1.24	1.13	1.43	1.26	0.07	0.024	0.041

treatments. The researchers speculated that greater insulin and insulin:glucose ratio with the hay-supplemented versus no-hay treatments could have been due to somewhat greater total dry matter intake (DMI).

Prior to weaning, average daily gain (ADG) was similar among treatments, as was starter DMI. However, the low-NDF treatments had greater gain:feed compared to the high-NDF treatments. While the amount of hay consumed was limited, it has been my experience that the amount of hay decreases both starter DMI and ADG.

In this study, there was no measure of rumen fill or gut contents as there was in the classical study by Stobo et al. (1966).

Terre et al. argued in a corollary study (Castells et al., 2013) that if forage intakes are above 10% of total solid feed intake (Coverdale et al., 2004; Suarez et al., 2007) or if there is no non-forage diet (Stobo et al., 1966), then there is no significant gut fill. Maybe it is more difficult or seldom measured, but there would have to be some gut fill or else rapid transit with reduced digestibility.

In study by Khan et al. (2011), I estimated that hay intake was 20-25% of DMI during weeks 6-10, and that significantly increased gut fill and distorted bodyweight gain (*Feedstuffs*, Sept. 11, 2011). The confounding factor in that study was that the so-called "texturized starter" actually was not well-texturized, as indicated by calves on that treatment having an acidotic rumen pH of 5.0.

Coverdale et al. (2004) used dietary treatments of coarse texturized calf starter, ground calf starter or coarse texturized calf starter with either 7.5% or 15.0% chopped orchard grass hay.

In one trial, DMI was held constant across these treatments, and calves fed the hay treatments had greater bodyweight gain and feed efficiency than calves fed the coarse texturized calf starter.

In a second trial, bodyweight gain, feed efficiency and age at weaning did not differ, while calf starter and total DMI tended to be greater with diets containing hay. However, without gut fill measurements, it is not possible to know how much of bodyweight gain was true growth or gut fill. Rumen fluid was sampled by stomach tube for VFA analysis but, surprisingly, was not measured for pH.

In the Terre et al. study, for the two weeks after weaning, hay treatments had greater ADGs, starter intakes and feed:gain ratios (Table). Cows on the low-NDF treatments spent more time lying and less time ruminating but had more abnormal behaviors (tongue rolling, licking surfaces or eating sawdust).

Cows on both hay treatments spent about an hour of that eight-hour observation period ruminating — which, if assumed to be consistent throughout a 24-hour period, would be three hours per day, or about 12% of the day. That compares to about 9% for a pelleted starter versus 21% for the texturized starter in the study by Porter et al. (2007).

The Bottom Line

These data show that even with a lower-starch (34%) all-pelleted starter, calves had a low acidotic rumen pH of about 5.0. When also provided with hay, calves consumed enough hay to elevate their rumen pH to 5.8. However, that confounds and distorts true bodyweight gain and apparent feed efficiencies.

In this case, all-pelleted starters were, in effect, negative controls. It would be good to have a well-texturized starter as a positive control in future studies with all-pelleted calf starters.

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