

Successful prevention of post-weaning growth dips in calves

Around weaning, a calf will stop relying mainly on milk to meet nutrient demands for maintenance and growth, and will move to solid feed.

The rumen is physically and metabolically underdeveloped at birth. As milk bypasses the rumen it has no effect on rumen development, which includes the establishment of anaerobic microbes and fermentation, growth in rumen volume and rumen papillae, development of absorption and metabolic pathways, and maturation of the salivary apparatus.

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To start rumen development, the calf needs to consume fermentable carbohydrates from solid feed, in particular sugars and starch from concentrate.

The rumen microbial population responsible for the fermentation process that follows will increase in number and diversify, producing fermentation acids.

These fermentation acids – particularly butyric acid, propionic acid and acetic acid – are absorbed through the rumen wall and are used as an energy source for the calf. Butyrate and propionate also stimulate the development of the rumen wall and the growth of the rumen papillae.

Over the last decade, many dairy experts have recommended feeding higher amounts of milk or milk replacer pre-weaning to increase rate of gain and to take advantage of the high feed efficiency of calves. What had not been established until recently is

Table 1. Milk replacers' protein and fat characteristics and intake over time for the control, moderate and aggressive treatments.

kg DM of calf milk replacer/day	Control 21% CP:21% fat	Moderate 27% CP:17% fat	Aggressive 27% CP:17% fat
0-5 days	0.44	0.66	0.66
6-39 days	0.44	0.66	0.87
40-42 days	0.22	0.33	0.87
43-49 days	-	-	0.43

	CON	MOD	AGG	SE	P
Total milk replacer consumed (kg/calf)	17.8	26.5	38.4	—	—
Starter intake (kg/day)	0.573 ^a	0.572 ^a	0.455 ^b	0.0389	0.01
ADG (kg/d)	0.354 ^a	0.507 ^b	0.553 ^b	0.0184	0.01
Gain to feed efficiency	0.349 ^a	0.488 ^b	0.475 ^b	0.0156	0.01
Hip width change (cm)	3.3 ^a	4.1 ^b	4.1 ^b	0.20	0.01
Body Condition Score (BCS) change	0.0 ^a	0.1 ^a	0.3 ^b	0.04	0.01

^{a,b} Means in the same row with different superscripts differ, P<0.05.

Table 2. Performances of calves fed three milk replacer programs over the 56 days of the nursery trial.

how this impacts pre-weaning growth and development, given that all other research points to the fact that solid feed seems to be vital for rumen development.

New research by Provimi

New research undertaken this year by Cargill's brand Provimi and the University of New Hampshire seems to disprove the value of high amounts of milk replacer post weaning.

In a trial carried out at Provimi Calf and Heifer Research Center, three different milk replacer feeding programs were tested to evaluate their impact on calf post-weaning growth and digestion performances.

Conventional (CON), moderate (MOD) and aggressive (AGG) milk replacement feeding programs were tested on 96 male three-day-old calves for 56 days.

Milk replacer characteristics and feeding rates are indicated in Table 1.

The calves were also offered a textured calf starter containing 20% crude protein

(CP) and ad libitum water for the entire 56 day experiment.

Calves were weaned either after 42 or 49 days of milk replacers feeding depending on the treatments. Body weight (BW), body condition score (BCS) and hip width were taken at the start of the experiment and then measured weekly for BW, and bi-weekly for hip width and BCS. Digestibility was measured after weaning between day 51 and 56 in five calves per treatment

Trial results

The results (Tables 2 and 3) showed that calves fed the conventional diet had the worst performance in terms of average daily gain (ADG), feed efficiency and hip width change.

ADG over the total experiment was numerically the highest for the aggressive feeding program, but no significant improvement on ADG and hip width change was detected between the moderate and the aggressive calf milk replacer programs. However, BCS change was significantly higher for calves fed aggressively.

Calves fed the aggressive CMR feeding program had the lowest starter intake during the experiment although starter intake increased after weaning.

The digestibility of dry matter and organic matter was also negatively affected, leading to lower growth performance around weaning. In addition, they had the lowest digestibility of organic matter, crude protein, neutral detergent fibre (NDF) and

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acid detergent fibre (ADF). The difference in NDF and ADF digestibility was particularly large, with calves on the aggressive milk feeding program having a digestibility half those of the moderate and control treatments. Other studies have also seen decreased digestibility with elevated milk feeding programs similar to the aggressive treatment used in this experiment.

Terré et al. (2007) and Hill et al (2010) both showed reductions in digestibility of DM from 5 to 10% points and a decrease in NDF of 15% points. Because fibre digestion is primarily influenced by cellulolytic fermentation in the rumen, the low digestibility of ADF and NDF indicates that the rumen cellulolytic activity is less well established in calves fed greater amounts of milk replacer.

This data therefore suggests that calves fed large amounts of milk during the pre-weaning phase have difficulty digesting solid feed during and immediately after weaning. This seems particularly true when starter feeds are high in NDF, even where this contains by-products that are relatively high in NDF digestibility as the one tested in this experiment. It also means that the weaning process should then be longer, with milk feed being stepped down in a more gradual way.

Higher amounts of calf milk replacer (CMR) in the calf's diet means they will

	CON	MOD	AGG	SE	P
Dry matter intake (kg/d) (0-56 days)	2.04	2.30	2.28	0.258	0.08
Digestibility (% day 51-56)					
Dry matter	77.6 ^a	76.9 ^a	66.0 ^b	1.67	0.01
Organic matter	79.2 ^a	78.2 ^a	67.9 ^b	1.65	0.01
Acid detergent fibre	56.3 ^a	53.2 ^a	26.7 ^b	3.89	0.01
Neutral detergent fibre	54.1 ^a	50.7 ^a	26.2 ^b	2.86	0.01
Starch	96.7	94.5	94.0	1.33	0.36
Crude protein	71.9 ^a	74.1 ^a	56.3 ^b	2.72	0.02
Sugar	93.1 ^a	91.5 ^a	86.2 ^b	1.68	0.02
Fat	81.4 ^a	83.2 ^a	74.1 ^b	1.84	0.01

^{ab} Means in the same row with different superscripts differ, P<0.05.

Table 3. Dry matter intake and total tract digestibility of nutrients in calves fed conventional, moderate and aggressive programs. Digestibility was measured from day 51-56.

grow more quickly during the pre-weaning phase. However, the growth slows down around weaning and with milk diets being more expensive, this results in higher costs per kg of gain when considering the pre- and post-weaning period altogether.

Feeding the calf more milk also means that the rumen develops more slowly, resulting in low digestibility of the solid feed post-weaning.

Digestion of all nutrients, but particularly NDF is essential, to ensure that rumen development is adequate prior to weaning.

For these reasons, the Nurture with Provimi Calf and Heifer program advises feeding a moderate milk feeding rate (at around 700g of milk replacer) alongside a well fermentable starter, rather than an aggressive program. To keep on tracking growth post weaning, it is advised to measure body weight at 90 days, rather than simply at weaning. ■

References are available on request from info@provimi.com