

Winter Milk Replacer Feeding Strategies

Most discussion about winter feeding strategies relates to feeding extra milk, Milk Replacer (MR), or fat during cold weather to help keep calves energized. Research in hutches and unheated nurseries from Canada, MN, and OH reported that calf growth declined as environmental temperature increased. So heat stress is the really big challenge. However, the first step in winter feeding is appropriate housing. Draft-free, yet well ventilated dry housing with deep straw bedding is the priority. If calves are housed in heated barns or rooms, ventilation becomes even more important, while added nutrients become less critical.

During a winter trial, when calves were fed 1.0, 1.25 or 1.5 lb of a 20% CP, 20% fat MR powder daily and weaned at 42 days, they grew better pre-weaning as more powder was fed. Post-weaning growth was the opposite and by 12 weeks of age, calf body weight was greatest for calves fed 1.0 lb of MR powder. Growth during the weaning period and post-weaning was influenced by more starter intake in calves fed 1.0 lb of MR powder.

Optimum calf growth relates to an optimum dietary protein to energy ratio. Calves fed 1.5 lb of a 20% CP, 20% fat MR did not grow much faster pre-weaning than calves fed 1 lb of the MR during this winter trial (Figure 1). However, calves fed 1.5 lb of a 28% CP, 20% fat MR grew considerably faster than the other treatments, indicating the impact of adequate protein when energy is increased. The protein to energy ratio has a similar impact on starter intake.

There is a maximum amount of milk or MR that can be fed to calves without depressing starter intake, nutrient digestion, and rumen development. This was demonstrated in a winter trial where calves were fed 4 milk replacer programs and weaned at 6 weeks of age: A) conventional 20% CP, 20% fat MR powder fed at 1.0 lb per calf daily, B) 26% CP, 17% fat MR powder fed at 1.5 lb per calf daily, C) 28% CP, 20% fat MR powder fed in a step-up fashion to a maximum of 2.5 lb per calf daily, and D) 26% CP, 17% fat MR powder fed in a step-up fashion to a maximum of 2.5 lb per calf daily. The rates fed of A and B were reduced by half on the last 3 days prior to weaning, while the rates of C and D were reduced by half on the last 7 days prior to weaning. Calves fed programs C and D had the least starter intake but were heavier during the first 4 to 5 weeks (Figure 2). Their rate of gain slowed during the weaning process and post-weaning. Some refer to this as a 'weaning slump' in growth and this is characteristic of all published trials where calves were fed approximately 1.8 lb of MR powder or 7 quarts of milk or more and stepped down on their liquid diet to complete weaning in a week or less. However, calves fed program B, a 26% CP, 17% fat powder fed at 1.5 lb/head daily, had equal to or better overall performance than the other treatments. Calves fed B were more than 16 lbs heavier after weaning than calves fed A.

Another winter experiment tested whether the weaning slump could be avoided in high MR feeding programs. In this experiment, 3 programs were used: A) a 26% CP, 17% fat MR was fed at 1.5 lb /day through day 39, and then fed at 0.75 lb/day from day 40 to 42, B) the same MR was fed at 1.8 lb/day from day 0 to 5, fed at 2.0 lb/day from day 6 to 21, and then fed as treatment A, and C) a 22% CP, 26% fat MR was fed at 1.8 lb/day from day 0 to 21, followed by the MR and rate used for treatments A and B. Calves fed B had greater weight gain, but starter intake was not changed vs. A (Table 1). Even though C provided the same amount of energy daily as B, calves fed B gained more weight and consumed more starter than calves fed C. This winter experiment was repeated and gave the same results. Canadian and



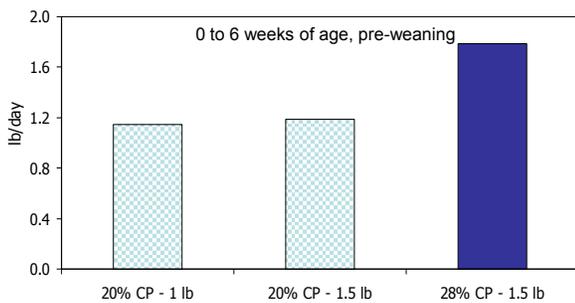
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Korean researchers have also implemented more gradual weaning programs employing 22 and 25 days to slowly step calves down on milk or MR using many step-down rates and avoided the 'weaning slump' in growth and starter intake.

Treatments A and B in the previously described trial were tested against a simplified modification of the Canadian and Korean step-down program as C) the same MR in A and B fed at 1.8 lb/day for day 0 to 5, 2.2 lb/day for day 6 to 28, 1.8 lb/day for day 29 to 32, 1.3 lb/day for day 33 to 36, 1.0 lb/day for day 37 to 39, and 0.5 lb/day for day 40 to 42. Both B and C resulted in greater weight gain and similar starter intake compared to A (Table 2).

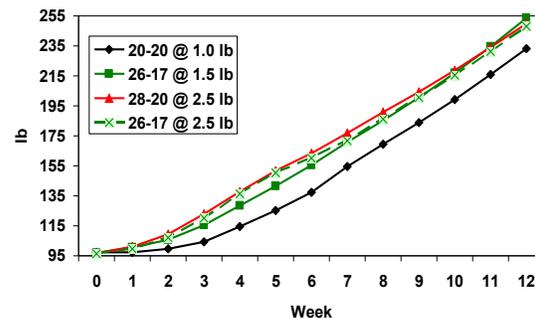
These trials suggest that if one chooses to increase MR fed during the winter, it is best done with a high protein MR in order to have adequate protein to match the energy fed. Additionally, if feeding rates of 1.8 lb of MR powder are employed, a gradual weaning of 14 to 21 days is needed to avoid a 'weaning slump' in growth and starter intake. Successful, simple and successful, and more complicated gradual weaning programs were tested that can be used on farms. High fat MR programs are not recommended based on poor results in research.

Figure 1. Average daily gain of calves fed 20% fat milk replacer powders with 20 and 28% CP at 1 or 1.5 lb daily during cold weather



Prof. Anim. Sci. 22:252-260 (2006)

Figure 2. Body weight of calves fed 4 different milk replacer programs



Prof. Anim. Sci. 23:649-655 (2007)

Table 1. Performance of calves fed added nutrients in the winter

Item	A) Low Rate	B) High Rate	C) High Fat
ADG, lb/day	1.63 ^a	1.73 ^b	1.50 ^c
Starter intake, lb/day	1.81	1.97	1.54
Milk replacer intake, lb/day	1.45	1.67	1.60
Feed efficiency, gain/feed	0.57	0.55	0.56

a,b,c Mean within rows differ ($P < 0.05$)

Table 2. Influence of 2 step-down feeding programs on calf performance

Item	A) Low Rate	B) High Rate	C) High Rate+Steps
ADG, lb/day	1.06 ^a	1.32 ^b	1.27 ^b
Starter intake, lb/day	0.99	1.18	1.12
Milk replacer intake, lb/day	1.45	1.75	1.82
Feed efficiency, gain/feed	0.52	0.54	0.52

a,b Mean within rows differ ($P < 0.05$)

References: Can. J. Anim. Sci. 58:517-520 (1978); Prof. Anim. Sci. 22:252-260 (2006), Prof. Anim. Sci. 23:656-664 (2007), J. Dairy Sci. 90:876-885 (2007), J. Dairy Sci. 90:3376-3387 (2007), J. Dairy Sci. 92:3281-3291 (2009), J. Dairy Sci. 92:5147-5153 (2009), J. Dairy Sci. 93:148-152 (2010), J. Dairy Sci. 93:1105-1115 (2010).

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