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Calf Note 188 - Double Birth Body Weight – How Realistic?

Introduction

How are your calves growing? An important question for any grower – essential, really. Comparing performance on the farm with industry benchmarks allows us to evaluate our program and determine whether we're doing a good job or if we need to make some changes.

One benchmark of growth in the appropriate age at which calves should double their birth body weight (**BW**). This metric has the advantage of being species independent and easy to remember and monitor. When the Dairy Calf and Heifer Association (formerly the Professional Dairy Heifer Growers Association) published their first "Gold Standards" for calf management, on important goal was to double calf birth BW by 60 days of age. Since then, many other organizations have embraced this goal, though it has changed somewhat to doubling birth BW by eight weeks of age (56 days). Though the difference between 8 weeks and 2 months may seem trivial, the calculated daily gain required to meet this target is not. For example, a calf weighing 42 kg at birth to double its BW by 60 days requires daily BW gain of 42 / 60 = 700 g/d whereas a calf doubling its birth BW by 56 days requires 42 / 56 = 750 g/d.

Since so many university extension departments, commercial firms, dairy nutritionists and veterinarians currently recommend that their producers use this as a goal for their young calves, it might be appropriate to consider whether the goal is actually being achieved by calf growers. Since relatively few dairies actually measure calf BW at birth or at 56 days (and fewer of these data are reported), I turned to the scientific literature to review studies and see how successful we were as an industry in achieving the target that we recommend to our producers.

The Survey

Published research studies that raised calves from birth through 56 days, 60 days or two months of age were evaluated. For some studies that reported BW at two months of age, I adjusted their ending BW to 56 days using preweaning ADG values. Only studies that reported starting BW were used.

Studies were collected from 25 different published experiments, representing 80 individual treatments. Each treatment represented from three to >20 calves/treatment. Body weight at birth and at 56 days was recorded. Treatments were from studies conducted primarily at universities and commercial research facilities that investigated levels of milk or milk replacer, form and nutrient content of calf starter, availability and type of forage in the diet and housing system. Few of these studies included "accelerated" liquid feeding programs wherein calves were fed milk for *ad libitum* consumption or fed >1 kg of milk powder daily. It was assumed that all herds were well managed.

Some descriptive statistics for the treatments evaluated are in Table 1. Final BW (at 56 days) averaged 74.8 kg, which was a gain of 32 kg, or 175% of birth BW. We can also calculate this as a multiple of maintenance – or 1.75x. An increase of 1.75x of birth BW is quite acceptable, but does not rise to the goal set by the professional organizations and university extension departments for our producers.

Of course, some experimental treatments could have been organized not to maximize growth rate, but to limit it. Sometimes, researchers will intentionally feed too much of one thing or too little of another as a means of testing an hypothesis. Therefore, it is possible that at least some of these treatments were not a fair evaluation of our ability to double birth BW by 56 days. In developing the survey, I attempted to include only those studies that evaluated nutritional treatments and not those that intentionally limited nutrition or otherwise stress calves.

Only five of 80 treatments were able to double birth BW by 56 days of age. So, doubling birth BW by 56 days appears to be a lofty goal indeed. The five treatments are summarized below.

Yavuz al. (2015) fed Holstein bull calves an average of 7.4 L of pasteurized whole milk per day to weaning at 56-d. The trial was conducted under thermoneutral conditions. Colostrum was fed for the first two days and a high quality calf starter was available throughout the trial. Body weight reached 79 kg by 56 d, an increase of 40.6 kg or 2.05 times birth BW.

Item, kg	Min	Max	Mean	SE
Initial BW	37.3	47.1	42.8	2.4
Final BW	57.4	90.6	74.8	7.3
Gain	16.9	44.9	32.0	6.9
ADG	0.301	0.802	0.571	0.123
% of Birth BW	137%	209%	175%	17%

Table 1. Summary statistics of 80 experimental treatments used to review growth of calves from birth to 8 weeks of age.

Moallem et al. (2010) fed young calves 9 L/d of whole milk and birth BW was doubled by 56-d. Interestingly, when calves were fed 9 L/d of reconstituted milk replacer, calves only achieved 1.9x birth BW by 56 days.

The final three treatments were achieved in the same study by Kmicikewycz et al (2013). The treatments included: 20% CP, 20% fat MR fed at 640 g/d to 42 d; a 26% CP, 18% fat MR fed at 880 g/d to 42 d; and a 26% CP, 18% fat MR fed at 870 g/d to 42 d. Also offered were an 18% CP texturized starter and water offered from d 1. Calves in all three treatments doubled their birth BW by 56-d and about 33% of BW gain after weaning (d 42-56).

Not included in the initial analysis was the research published by Soberon et al. (2012), which I will consider separately. In this study, calves at the Cornell dairy were fed 1.5% of birth BW (0.63 kg DM/d) for the 1st 7 d, 2.0 to 2.5% (0.8 to 1.1 kg DM/d) of birth BW to d 42 (15% DM). Calves were weaned at 49 d by feeding 1X/d from d 42-49. BW at weaning (49 d) = 82 kg, or 1.96x birth BW. Although these authors did not report BW at 56-d, we can assume that unless calves did not grow at all or lost BW from 49 to 56 d, that they would have doubled birth BW by 56 days. Interestingly, BW gain was reported to range from 0.1 to 1.58 kg/d and the authors attributed this variation to heat and cold stresses and varying colostrum status of the calves.

The second group for which data were reported by Soberon et al. (2012) involved a commercial dairy that followed the feeding protocol of 0.9 kg milk replacer (28% CP/15% Fat) from d 7 to weaning at about 49 d of age. Data on growth to weaning are somewhat conflicting within the manuscript, however. The authors reported that BW at weaning (about 49 d) was 84.1 kg, or 1.98x birth BW or 0.74 kg/d. However, the authors also reported that preweaning ADG = 0.66 kg/d. Calves at birth were 42.6 kg, so if calves gained 0.66 kg/d to weaning at 49 days, then BW at weaning would be 74.9 kg, which = 1.76x birth BW.

The authors wrote "*On the commercial dairy, the observed preweaning ADG was similar in range and the mean was 0.66 ± 0.11 kg, with a range from 0.32 to 1.27 kg. These data most likely represent the reality of growth rates observed on most farms, assuming that environmental conditions and calf health challenges are reflected in the range.*". It seems likely, then, that the actual preweaning was ADG did not allow the calves to double birth BW by 56 d.

The likelihood of doubling birth BW might be greatest when calves were fed "accelerated" growth programs. These studies were evaluated separately. Table 2 shows results from several accelerated milk feeding studies. Even when large amounts of milk or milk replacer are fed pre-weaning, doubling birth BW is challenging even for the best managers.

Summary

Doubling birth BW prior to weaning is challenging. Few studies in the scientific literature document such animal performance. Growth pre-weaning has been attributed to improved milk production post-calving, so it's important to monitor growth. However, these data suggest that many factors can affect pre-weaning growth and simply feeding lots of milk pre-weaning may not achieve our goals.

Author	Treatment	Double BW?
Morrison et al., 2012	1,000 g/d: 41.7 to 71.2 kg	No (1.7x)
Morrison et al., 2012	1,250 g/d: 41.4 to 75.4 kg (1.8x)	No (1.8x)
Davis-Rincker et al., 2011	Accelerated: 44.6 to 81.9 kg	No (1.8x)
Shamay et al., 2005	Ad lib suckling 5-60 d: 35.0 to 84.0 kg	Yes (2.4x)
Raeth-Knight et al., 2011	IHS: 40.6 to 81.5 kg	Yes (2.0x)
Raeth-Knight et al., 2011	ILS: 39.5 to 78.5 kg	Yes (2.0x)
Raeth-Knight et al., 2011	IHS: 40.3 to 85.8 kg	Yes (2.1x)

Table 2. Review of studies wherein calves were fed higher levels of milk feeding pre-weaning.

References

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