Milk yield of calves fed whole milk evaluated

SOME readers may recall the seminal study by Soberon et al. (2012) of the impact of calf daily gain during the first two months of life and subsequent milk production (Feedstuffs, March 12, 2012).

That study used 10 years of calf growth data and 1,244 records from the subsequent first lactation from the Cornell University research herd. Another New York herd was also identified that had 623 lactation records over a five-year period from calves that had been fed the same milk replacer program.

The Cornell model found that for every additional pound of average daily gain (within the range of 22.5-30 lb. per day) within the first two months of life, heifers produced 850 lb. more milk during their first lactation and 2,280 lb. more during their first three lactations. The low end of this range was due to colder weather, which negatively affected subsequent milk production because less energy was available over increased maintenance needs for young calves, resulting in their lower growth rate.

More recently, Soberon and Van Amburgh (2013) used 12 studies for a meta-analysis and found that an average of 1,550 lb. of milk were realized in the first lactation for each 1 lb. difference in daily gain during the first two months of age.

Recently, Kiezebrink et al. (2015) conducted a study specifically to evaluate feeding calves two different levels of whole milk and comparing their subsequent first-lactation milk yield.

The study included 152 Holstein heifer calves (birth weight of 93 lb.) that were housed in an insulated and mechanically ventilated facility at the University of Guelph in Ontario. Calves were fed two liters of pooled colostrum within 90 minutes of birth and, 8-12 hours later, were fed another two liters of colostrum. Calves were in individual pens of about 4.0 ft. x 4.9 ft. that were bedded with sun-dried wood shavings.

Calves were assigned at birth in a 2 x 2 factorial arrangement of treatments: (1) 10 hours of light, 14 hours of dark and fed four liters of milk per day, (2) 10 hours of light, 14 hours of dark and eight liters of milk per day, (3) 18 hours of light, six hours of dark and four liters of milk per day and (4) 18 hours of light, six hours of dark and eight liters of milk per day.

Calves were bucket-fed milk for 30 minutes twice daily at 0700 and 1600 hours and were offered free-choice water and a 20% crude protein, texturized calf starter. Unpasteurized milk was fed from the milking parlor and was analyzed weekly; the milk averaged 31.6% fat, 26.8% protein, 34.1% lactose and 7.5% ash. Estimated dry matter intake from the milk fed was 1.17 lb. for the four-liter treatments. Unpasteurized milk was fed from the milking parlor and was analyzed weekly; the milk averaged 31.6% fat, 26.8% protein, 34.1% lactose and 7.5% ash. Estimated dry matter intake from the milk fed was 1.17 lb. for the four-liter treatments.

Milk, water and starter intake were measured daily. Calves were weighed and wither height measured weekly until the end of weaning at 56 days of age. The study was done over the 2005-07 period of calvings.

After weaning, calves were weighed and wither heights were measured at weeks 12, 16, 20 and 24. From abrupt weaning until six months of age, calves were commingled into groups and managed according to the farm’s standard operating procedures. From weaning until six months of age, all calves were fed 5.5 lb. per day of texturized call starter and had free access to alfalfa hay and water. At six months of age, heifers were fed a total mixed ration. At four hours post-feeding, rumen fluid was aspirated on days 28, 35, 42 and 56 and analyzed for pH.

Results
Calves that were fed four liters of milk consumed 25.1, 26.9, 27.7, 27.8, 27.9, 28.0 and 27.7 liters weekly, while calves given eight liters of milk consumed 39.8, 49.8, 51.8, 51.6, 51.4, 52.0, 51.8 and 50.9 liters weekly.

Starter intake was inversely related to milk intake by treatment but progressively increased by week as bodyweight increased.

Water intake paralleled starter intake, following the well-established interrelationships among milk, starter and water intake (Kertz et al., 1984; Kertz and Loften, 2013; Feedstuffs, March 10, 2014).

In this study, for the first 56 days until weaning, starter intake averaged 1.4 lb. daily for the four-liter treatments versus 0.57 lb. daily for the eight-liter treatments. This relationship with starter intake is not only tied to the quantity of milk/milk replacer fed but also to energy content and intake.

In a classic study by Kuehn et al. (1994), when calves were fed a milk replacer containing either 15.6% or 21.6% fat, calves ate more starter and total energy with the 15.6% fat treatment, had greater daily gain before weaning and had some carryover differences for two weeks after weaning. This is why calf trials should always measure intake and performance for two weeks after weaning, because that is part of the four-week weaning transition period.

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Calves that are fed high levels of milk and/or milk replacers with more than 15-20% fat may do very well before weaning, but if starter intake is low (less than 1 lb. daily) before full weaning, they will struggle after weaning. With too many other major changes at the same time, calves are more likely to experience a respiratory problem and become impaired for life.

Rumen pH values during weeks 4-8 were greater for calves fed eight liters compared to calves fed four liters of milk, most likely due to the lower starter intake when more milk was fed. On the other hand, rumen pH values were within a range of 5.77-5.93 for calves fed four liters. These are typical rumen pH values for young calves fed well-texturized starters but are even lower when calves are fed meal or pelleted starters without any forage (Feedstuffs, July 14, 2014). I think these rumen pH values for young calves are lower than what would be expected compared to cows, because they do not yet have an established protozoa population.

Daily gain was less (P < 0.0001) during the first two months for calves fed four liters of milk — 1.37 lb. versus 1.71 lb. per day for the calves fed eight liters of milk. The latter daily gain doubled birth weight by the end of two months of age — the target to enhance milk production in the first lactation based on data from Soberon et al. (2012).

Bodyweight was statistically greater for calves fed eight liters compared to calves fed four liters throughout the study (n = 75-77), except for the measurement at week 16 and weeks 78 and 104.

While, at one time, it was felt that the main advantage for an intensified calf feeding program was to decrease the age at first calving, in many such studies, bodyweight differences from the first two months largely disappeared by six months of age or later. The study by Soberon et al. (2012) indicated that the increased daily gain in the first two months of age (doubling birth weight) is what has the greater effect on milk yield in the first and subsequent lactations. This difference is thought to be established during the first two months of age due to epigenetics, early mammary development and hormonal/metabolic effects.

The wither height increase exhibited a similar pattern to weight gain for the eight-liter versus four-liter feeding schedule. In a previous study, Kertz et al. (1998) noted that heifers’ wither height increased by about 12 in. at the end of six months of age. Unfortunately, Kiezebrink et al. (2015) did not measure wither height beyond six months of age.

No treatment effects (Table) were noted in the first lactation (n = 53-58) related to different milk feeding programs during the two-month calf period.

Kiezebrink et al. noted several factors that could have influenced the lack of first-lactation differences: The calves were kept in a temperature-controlled, mechanically ventilated environment during their first two months of life, and there could be an interaction between whole milk and calf starter as nutrition sources. Likewise, similar measurements in some other studies have not always shown positive results, either.

The Bottom Line
Calves in an environmentally controlled facility during their first two months of age that were fed either four or eight liters of non-pasteurized whole milk increased daily gain (doubling birth weight) and also had increased wither height, but these differences did not persist by the first calving. Milk production and composition in first lactation did not differ by calf treatment, indicating that more factors are likely involved in this situation than are currently understood.

References