

Can Maternal Colostrum Be Replaced by Commercial Products for Feeding Newborn Calves?¹

Klibs N. Galvao²

Introduction

Colostrum management and feeding are critical for calf health, calves' future productive life, and farm profitability (Robison et al. 1988; Faber et al. 2005). Current recommendations state that a calf needs to ingest at least 150–200 g of immunoglobulin G (IgG) within two hours of birth to achieve successful passive transfer (Chigerwe et al. 2008a). It is understood that this can be reached by feeding 3–4 L of good quality maternal colostrum (MC); namely, a MC with IgG concentration greater than 50g/L, a bacterial count less than 100,000 cfu/mL, and a coliform count less than 10,000 cfu/mL (McGuirk and Collins 2004; Chigerwe et al. 2008a). A colostrometer can be used as an on-the-farm test for guidance on colostrum quality. When the colostrometer reads 70g/L or more, then the colostrum contains at least 50g/L IgG (Chigerwe et al. 2008b).

However, when colostrum quality is poor or unavailable, colostrum replacer (CR) may be a suitable alternative to MC because it is easier to store and process. Colostrum replacer may have advantages over MC when considering bacterial contamination, as recent studies have found that feeding CR can reduce the transmission of John's disease by 44% (Pithua et al. 2009). Researchers have found varying success rates of passive transfers when CR is used. While Poulsen et al. (2010) found no significant difference in rates of passive transfer between a bovine serum-based CR and maternal colostrums, Swan et al. (2007) found higher rates

of passive transfer failure when CR was fed, which could impair health and survival. Fidler et al. (2011) and Godden et al. (2009) found similar results when calves were fed a commercial CR at the recommended dose. Despite higher rates of failure of passive transfer, a recent report found no difference in mortality rates from birth to first calving (Pithua et al. 2010). Nonetheless, others have observed that mortality was twice as high for heifers with passive transfer failure compared to heifers with successful transfer (Robison et al. 1988; Wells et al. 1996). More information on morbidity and mortality of calves fed CR would improve the body of knowledge and help the producer make an informed decision about colostrum feeding management.

Therefore, the objective of this article is to present the results of a recent publication (Priestley et al. 2013) that evaluated the effects of feeding MC, one dose of plasma-derived CR (PDCR), or one dose of colostrum-derived CR (CDCR) on serum total protein (TP), IgG concentration, calf morbidity (disease incidence), calf mortality, and weight gain from birth to weaning.

Calf Performance Receiving MC or CR

At birth, calves were randomly assigned to one of three treatment groups—MC (n = 49): 3.8 L of maternal colostrum; PDCR (n = 49): 550 g (one dose; 150g of IgG) of a PDCR; CDCR (n = 49): 470 g (one dose; 100g IgG)

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2. Klibs N. Galvao, DVM, MPVM, PhD, Dipl. ACT, Department of Large Animal Clinical Sciences, College of Veterinary Medicine; UF/IFAS Extension, Gainesville, FL 32611.

of a CDCR. Serum TP were greater ($P < 0.05$) for calves fed MC (mean \pm SE; 6.14 ± 0.11 g/dL) than for calves fed PDCR (5.29 ± 0.11 g/dL) and CDCR (5.27 ± 0.11 g/dL). Serum IgG concentrations were greater ($P < 0.05$) for calves fed MC ($2,098 \pm 108$ g/dL) than for calves fed PDCR (927 ± 107 g/dL) and CDCR (1139 ± 108 g/dL). Apparent efficiency of absorption was greater ($P < 0.05$) for CDCR than PDCR (38.8 ± 3.0 vs. $21.6 \pm 3.0\%$). Adequate passive transfer was greatest for MC (91.8%), followed by CDCR (49%) and PDCR (28.6%) (Figure 1). Calves fed MC had greater weaning weights (61.2 vs. 58.4 ; $P < 0.05$) and body weight gain than calves fed CR (24.6 vs. 21.8 ; $P < 0.05$; Figure 2). Morbidity (pneumonia, diarrhea, septic arthritis, or navel ill) was lower ($P < 0.05$) for calves fed MC (46.9%) than for calves fed PDCR (71.4%) or CDCR (67.3%) (Figure 3). Calves fed MC tended ($P = 0.06$) to have lower mortality than calves fed CR (8.2 vs. 20.4% ; Figure 4) as well.

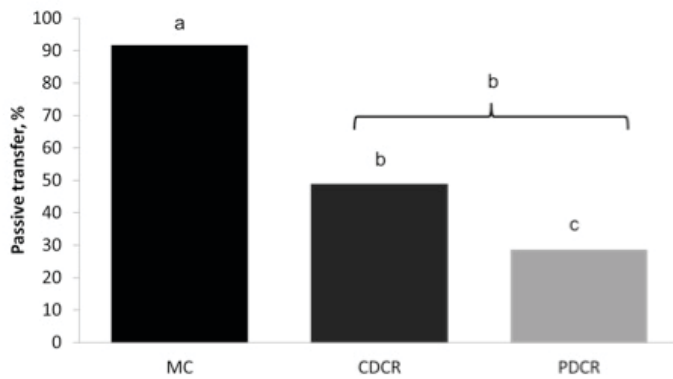


Figure 1. Proportion of calves with successful passive transfer of immunity (serum IgG \geq 1000 mg/dL). MC = calves ($n = 49$) that within two hours of birth were fed 3.8 L of maternal colostrum; PDCR = calves ($n = 49$) that within two hours of birth were fed 550 g of plasma-derived colostrum replacer (Acquire Colostrum Replacer) containing 150 g of IgG dissolved in warm water to make 3.8 L of solution; CDCR = calves ($n = 49$) that within two hours of birth were fed 470 g of colostrum-derived colostrum replacer (Alta Calf's Choice Total Balanced) containing 100g IgG dissolved in warm water to make 3.8 L of solution. ^{abc}Letters above bars indicate significantly differences ($P < 0.05$) between groups. ^{abc}Letters above bracket indicate significantly differences ($P < 0.05$) between MC and CR (CDCR + PDCR).

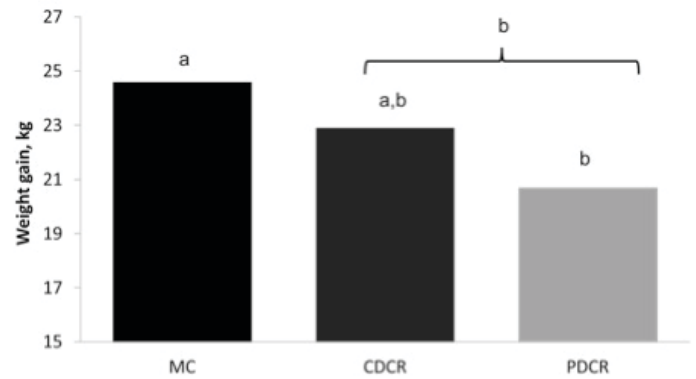


Figure 2. Weight gain from birth to calving. MC = calves ($n = 49$) that within two hours of birth were fed 3.8 L of maternal colostrum; PDCR = calves ($n = 49$) that within two hours of birth were fed 550 g of plasma-derived colostrum replacer (Acquire Colostrum Replacer) containing 150 g of IgG dissolved in warm water to make 3.8 L of solution; CDCR = calves ($n = 49$) that within two hours of birth were fed 470 g of colostrum-derived colostrum replacer (Alta Calf's Choice Total Balanced) containing 100g IgG dissolved in warm water to make 3.8 L of solution. ^{abc}Letters above bars indicate significantly differences ($P < 0.05$) between groups. ^{abc}Letters above bracket indicate significantly differences ($P < 0.05$) between MC and CR (CDCR + PDCR).

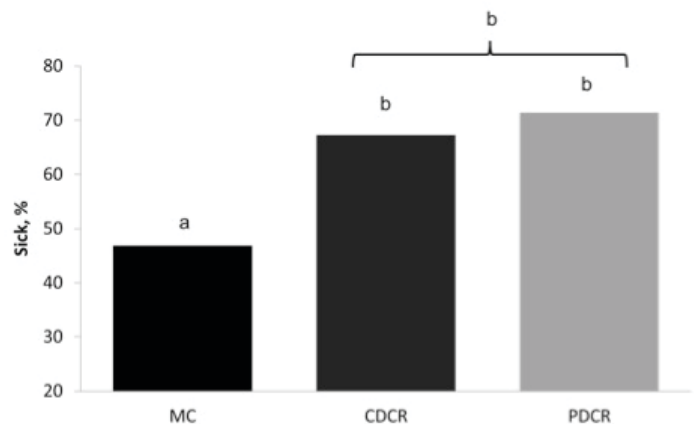


Figure 3. Proportion of sick (pneumonia, diarrhea, septic arthritis, or navel ill) calves from birth to weaning. MC = calves ($n = 49$) that within two hours of birth were fed 3.8 L of maternal colostrum; PDCR = calves ($n = 49$) that within two hours of birth were fed 550 g of plasma-derived colostrum replacer (Acquire Colostrum Replacer) containing 150 g of IgG dissolved in warm water to make 3.8 L of solution; CDCR = calves ($n = 49$) that within two hours of birth were fed 470 g of colostrum-derived colostrum replacer (Alta Calf's Choice Total Balanced) containing 100g IgG dissolved in warm water to make 3.8 L of solution. ^{abc}Letters above bars indicate significantly differences ($P < 0.05$) between groups. ^{abc}Letters above bracket indicate significantly differences ($P < 0.05$) between MC and CR (CDCR + PDCR).

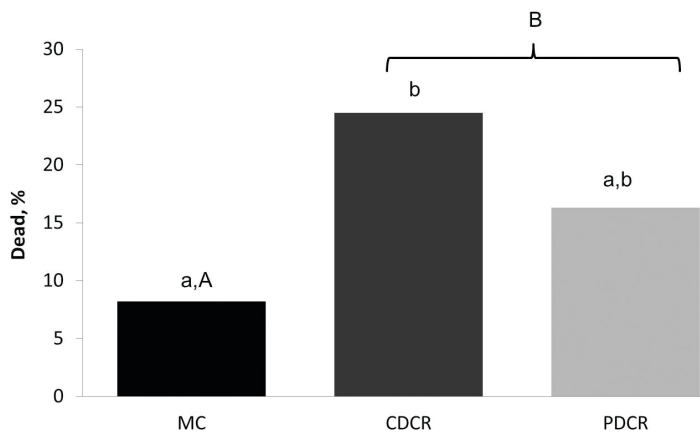


Figure 4. Proportion of dead calves from birth to weaning. MC = calves (n = 49) that within two hours of birth were fed 3.8 L of maternal colostrum; PDCR = calves (n = 49) that within two hours of birth were fed 550 g of plasma-derived colostrum replacer (Acquire Colostrum Replacer) containing 150 g of IgG dissolved in warm water to make 3.8 L of solution; CDCR = calves (n = 49) that within two hours of birth were fed 470 g of colostrum-derived colostrum replacer (Alta Calf's Choice Total Balanced) containing 100g IgG dissolved in warm water to make 3.8 L of solution. ^{abc}Letters above bars indicate significantly differences ($P < 0.05$) between groups. ^{AB}Letters above bracket indicate a tendency towards significance ($P = 0.06$) between MC and CR (CDCR + PDCR).

Conclusion

Given the conditions of this trial, feeding 3.8 L of MC was a better option than feeding one dose of CR. Based on the results for successful passive transfer of immunity, if MC is not available at the farm, then feeding at least two doses of a colostrum-derived CR would be recommended. Another possible use of CR is to improve the quality of MC with a colostrometer reading < 70 g/L. In that case, one dose of colostrum-derived CR should be mixed with 3.8 L of MC. Nonetheless, further research is needed to evaluate calf performance when a higher dose of CR is fed.

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