**Is Providing a Colostrum Replacer Beneficial Beyond Initial Feeding?**

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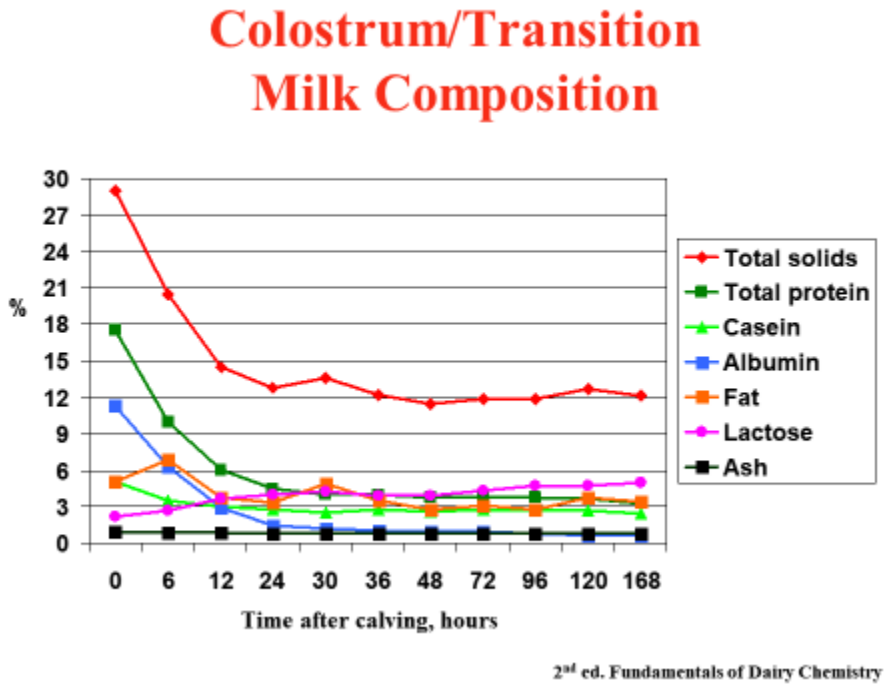
Colostrum is generally defined as the first milking from a cow postpartum. Over the next 3 days, its composition transitions to more normal milk as seen in this graph (Kertz 2019, p. 10). There are numerous bioactive components in colostrum and transition milk too. Many of these such as insulin, growth hormone, and IGF-1 are anabolic while other such as lactoferrin are antimicrobial. Their levels decrease as colostrum transitions to normal milk.




Transition milk is typically defined as milk from a cow for 3 days after calving following the first milking of colostrum. In the United States (US) dairy industry in the 1970s, it was recommended and fairly well practiced that calves be fed colostrum and transition milk for the first 3 days of life. The main reason was that transition milk did not meet the legal definition for dairy farms to sell that milk. That gradually began to change as US dairy farms got larger. Transition milk was then either put into the bulk tank where it did not really have any impact on composition of milk sold, or it was combined with "hospital" milk which now is often pasteurized and fed to calves.

It if is not feasible to feed transition milk for 3 days after initial colostrum feeding, maybe it would be beneficial to feed as a supplement a colostrum replacer instead of transition milk. That was the approach generally studied by a group at the University of Guelph in Ontario, Canada (McCarthy et al., 2024).

This experiment was conducted at a large commercial dairy farm in southern Ontario milking 1600 cows. The high volume of cows allowed for all calves to be enrolled in a short period. All Holstein heifer calves born from June 2021 to August 2021 were enrolled at birth in this randomized control trial. Calves were not allowed to suckle and were then fed 3.2 liters of bovine-derived colostrum replacer (CR) containing 205 g of IgG (29% IgG and 22% fat, DM basis) within 1 hour of birth via esophageal tubing. All calves received a second feeding like the first feeding 12 hours later.

Calves (n = 200) were randomly allocated to treatments as fed: (1) 450 g of MR (milk replacer of 27% protein and 19% fat DM basis) from day 2 to 14 (control, **CON**), (2) 380 g of CR + 225 g of MR from day 2 to 3, then 450 g of MR from day 4 to 14 (transition, **TRAN),** (3) 45 g of CR + 450 g of MR from day 2 to 14 (extended, **EXT**); or (4) 380 g of **CR** + 225 g of MR from day 2 to 3, then 45 g of CR + 450 g of MR from day 4 to d 14 (transition + extended, **TRAN+EXT**). Treatments were based on some previous studies. MR was fed by bottle twice daily at 0700 and 1600 hours. The weaning process began on day 42 and followed a subsequent step-down process with complete weaning on day 49. Calves were fed free choice water and calf starter (21.9% protein, 3.1% fat, 34.1% starch, DM basis), All calves were fed 600 g of MR reconstituted to 4 liters twice daily. Calves began the weaning process on day 42 and followed a subsequent step-down process with complete weaning at day 49.

The general pattern (**Table 1)** was that calves fed the most CR had the greatest ($P$ <0.01) nutrient content, osmolality, and IgG delivered followed by the EXT treatment.

**Table 1.** Composition of **CON** all MR day 2 to 49, T**RANS** half CR and half MR day 2 to 3 with all MR day 4 to 49, **EXT** 91% MR plus 9% CR day 2 to 14 and all MR day 15 to 49, **CR** colostrum replacer half MR and half CR day 2 to 3 with 91% MR plus 9% CR day 4 to 14 and all MR day 15 to 49.

| Item | CON | TRANS | EXT | CR |
|---|---|---|---|---|
| **Fat, %** | 1.85[a] | 2.96[b] | 2.17[a] | 3.84[c] |
| **Protein, %** | 3.88[a] | 9.74[b] | 4.80[a] | 11.33[c] |
| **Osmolality, mOsm** | 396[a] | 478[b] | 402[a] | 500[c] |
| **IgG, %** | 0.0[a] | 17.0[b] | 2.5[c] | 27.0[d] |
| **IgG delivered,%** | 0.0[a] | 102.5[b] | 12.2[c] | 205.0[d] |
| **Calculated ME, Mcal/kg** | 0.60[a] | 0.96[b] | 0.69[c] | 1.03[d] |

[abcd]$P < 0.01$ where superscripts differ.

However, intakes of MR, starter, and metabolizable energy (ME) did not differ among treatments **(Table 2**). This indicates that any treatment performance differences would not be due to nutrient intake differences since there were none.

**Table 2.** Composition of **CON** all MR day 2 to 49, T**RANS** half CR and half MR day 2 to 3 with all MR day 4 to 49, **EXT** 91% MR plus 9% CR day 2 to 14 and all MR day 15 to 49, **CR** colostrum replacer half MR and half CR day 2 to 3 with 91% MR plus 9% CR day 4 to 14 and all MR day 15 to 49.

| Item | CON | TRANS | EXT | CR |
|---|---|---|---|---|
| **Preweaning day to 42** | | | | |
| **Starter intake, lb/day** | 0.33 | 0.37 | 0.35 | 0.35 |

| | | | | |
|---|---|---|---|---|
| **Milk replacer intake, lb/day** | 2.60 | 2.60 | 2.55 | 2.60 |
| **ME intake, Mcal/day** | 5.37 | 5.40 | 5.36 | 5.38 |
| **Weaning transition day 43 to 49** | | | | |
| **Starter intake, lb/day** | 1.13 | 1.21 | 0.97 | 0.81 |
| **Milk replacer intake, lb/day** | 1.17 | 1.19 | 1.19 | 1.19 |
| **ME intake Mcal/day** | 3.20 | 3.21 | 3.21 | 3.24 |

**Figure 1** (all figures kindly provided by Dr. Mike Steele) illustrates that differences in average daily gains (ADG) were most evident during the first 2 weeks; and especially during the first week on the study. There were no differences among treatments in serum IgG levels (data not shown) but there was less diarrhea and mortality when CR was fed for either a high amount for a short period or lower concentrations for an extended period of time.

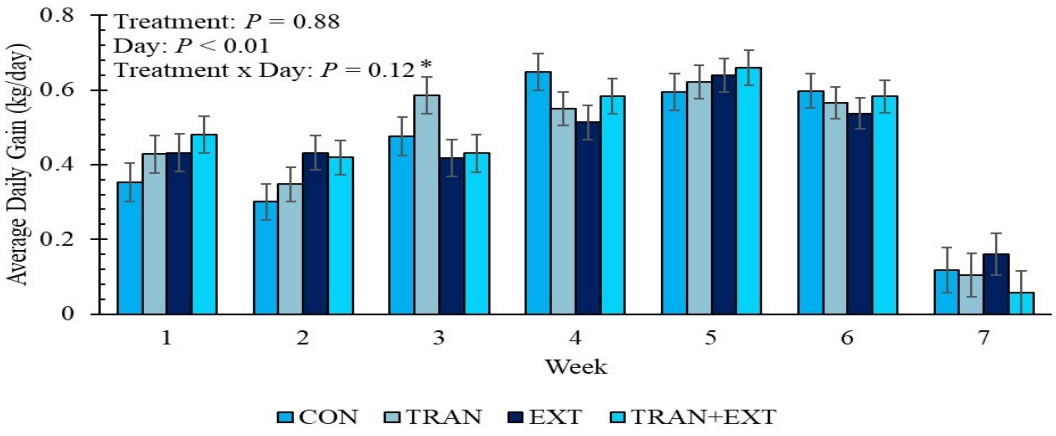



**Figure 1.** Effect of the transition, extended, and transition with extended colostrum supplementation diets compared to a control diet on average daily gain for wk 1 - 7. Holstein heifer calves (n=50/trt) received 1 of 4 treatments: 1) control (CON): 100 % milk replacer (MR) from d 2 – d 49; 2) transition (TRAN): 50 % colostrum replacer (CR) + 50 % MR d 2- d 3 and 100 % MR d 4– d 49; 3) extended (EXT): 91 % MR + 9 % CR d 2– d 14 and 100 % MR d 15– d 49; or 4) transition + extended (TRAN+EXT): 50 % CR + 50 % MR d 2- d 3, 91 % MR + 9 % CR d 4– d 14, and 100 % MR d 15– d 49. Symbols denote treatment differences within a specific timepoint. Significant treatment differences * $P \leq 0.05$

But the greater benefit in this herd appeared to be reducing morbidity and mortality as seen in **Figures 2 and 3** whereby providing CR as TRAN and EXT reduced the statistical hazards of diarrhea occurring in the first 21 days. The CR supplementation with EXT treatment resulted in greater survival than CON calves.

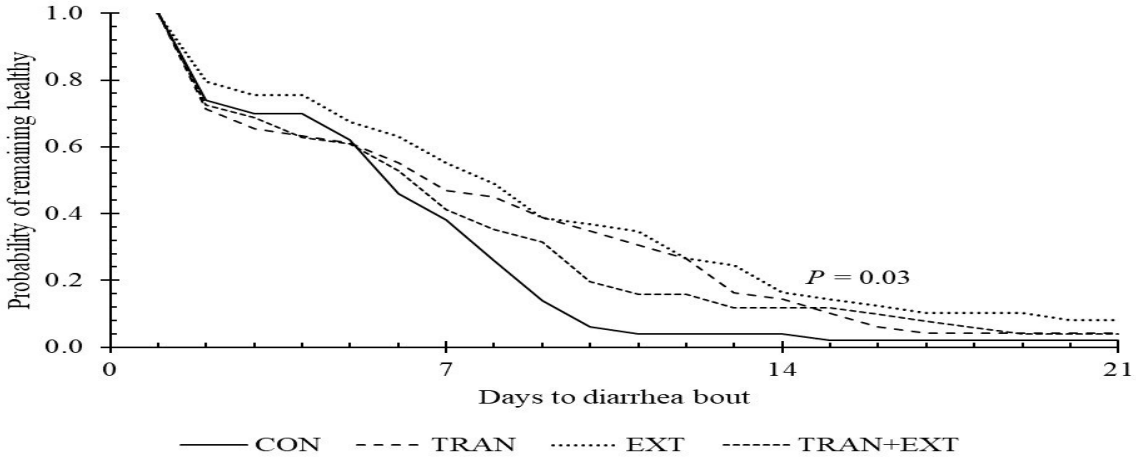



**Figure 2.** Effect of the transition, extended, and transition with extended colostrum supplementation diets compared to a control diet on probability of a calf undergoing a bout of diarrhea using Kaplan-Meier survival estimates. Holstein heifer calves (n=50/trt) received 1 of 4 treatments: 1) control (CON): 100 % milk replacer (MR) from d 2– d 49; 2) transition (TRAN): 50 % colostrum replacer (CR) + 50 % MR d 2 – d 3 and 100 % MR d 4– d 49; 3) extended (EXT): 91 % MR + 9 % CR d 2– d 14 and 100 % MR d 15– d 49; or 4) transition+ extended (TRAN+EXT): 50 % CR + 50 % MR d 2– d 3, 91 % MR + 9 % CR d 4– d 14, and 100 % MR d 15– d 49.

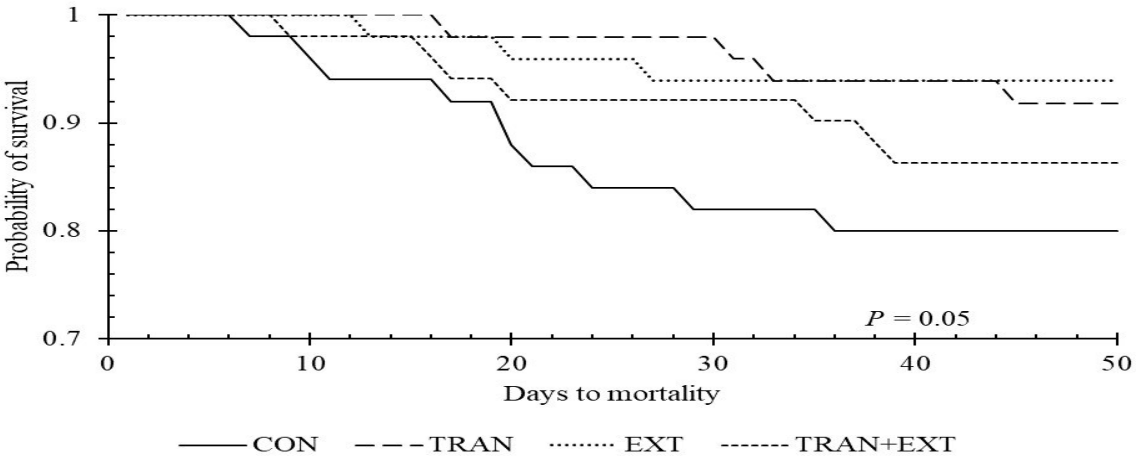



**Figure 3.** Effect of the transition, extended, and transition with extended colostrum supplementation diets compared to a control diet on probability of a calf surviving the preweaning period using Kaplan-Meier survival estimates. Holstein heifer calves (n=50/trt) received 1 of 4 treatments: 1) control (CON): 100 % milk replacer (MR) from d 2– d 49; 2) transition (TRAN): 50 % colostrum replacer (CR) + 50 % MR d 2 – d 3 and 100 % MR d 4– d 49; 3) extended (EXT): 91 % MR + 9 % CR d 2– d 14 and 100 % MR d 15– d 49; or 4) transition + extended (TRAN+EXT): 50 % CR + 50 % MR d 2– d 3, 91 % MR + 9 % CR d 4– d 14, and 100 % MR d 15– d 49.

Colostrum replacer can provide some flexibility in calving situations such as on late night shifts which may not be able to manage milking, handling, and feeding colostrum very well. I also recall a pivot point irrigation grazing dairy which was not able to manage calving, and harvesting, handling and feeding it to calves very well. Young calf deaths and health issues prompted the calf manager to use

CR for each calf. The dairy owner was not happy initially with that cost, but that was the best solution to the situation which was much more costly otherwise.

**The Bottom Line**

Feeding a colostrum replacer (CR) for a short period at higher amounts or for an extended period at lower concentration were both beneficial in realizing greater daily gain and lesser diarrhea and mortality. The cost-benefit will vary for a given dairy's situation.

**References**

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