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Managing Passive Transfer Variability at Calf Ranches: Effects of Hyperimmunized Bovine Colostrum Supplementation on Health Outcomes

OVERVIEW

Calf ranch operations are designed to optimize calf-rearing efficiency by reducing as many variables as possible with standardized management protocols. However, the health status of calves upon arrival can be highly variable. Incoming cohorts often differ substantially due to variation among source farms in colostrum management, hydration status, and the degree of transportation stress experienced prior to arrival, all of which can influence calf health, long-term performance, and calf ranch profitability.

This study evaluated a hyperimmunized bovine colostrum concentrate (First Defense Technology®, ImmuCell® Corporation) as a management tool for calf ranches to increase the immune status of calves upon arrival, particularly for those with suboptimal passive transfer.

STUDY DESIGN

At a Wisconsin calf ranch in October 2025, a total of 574 calves from more than 14 source farms were enrolled. Calves were a mix of replacement heifers and dairy x beef crosses and ranged from 1 to 7 days old. Calves were not randomized, reflecting the operational realities of commercial calf ranch management where interventions are often implemented at the processing level.

TREATMENTS

Upon arrival, control calves (n = 286) were housed in separate rows from the treatment calves (n = 288) and received the standard milk feeding program, which routinely included neomycin and probiotics. Treatment calves received the same feeding program with the addition of 30 grams of dried hyperimmunized colostrum at arrival.

Bovine colostrum was hyperimmunized to increase concentrations of specific antibodies against *Escherichia coli (E. coli)* and coronavirus while preserving the broad spectrum of naturally occurring antibodies against other bovine pathogens, as well as other important bioactive components present in colostrum. Health outcomes evaluated through weaning (68 days) included scours incidence, pneumonia incidence, pre-weaning removal, and average daily gain (ADG). Passive transfer was assessed using serum total protein (TP) measured on arrival, and calves were stratified by TP quartiles (Table 1).

Passive Transfer Quartile	TP Range g/dL	Control Calves	Treat-ment Calves	Total	Mean TP
Calves		286	288	574	
Q1 (Lowest)	<5.7	65	86	151	4.72
Q2	5.8-6.4	71	79	150	6.12
Q3	6.5-7.0	69	68	137	6.73
Q4 (Highest)	>7.1	81	55	136	7.63

Table 1

INTERPRETING THE DATA

Overall pre-weaning removal occurred in 3.1% of First Defense Technology calves compared with 6.3% of control calves (odds ratio [OR] 0.47; P = 0.073). Pneumonia incidence was numerically lower in First Defense Technology calves (treatment 26.4% vs control 32.5%; OR 0.75; P = 0.13). Incidence of scours and ADG did not differ between groups.

The stratified analysis of TP demonstrated that calves in the lowest passive transfer quartile experienced the highest disease impact. However, within this quartile, First Defense Technology treatment was associated with a higher proportion of calves requiring no disease intervention (treatment 38.4% vs control 21.5%; OR 0.44, P = 0.03).

The observed reduction in pneumonia is notable. While the primary function of the *E. coli* and coronavirus antibodies in First Defense Technology is to mitigate enteric disease, emerging literature suggests the presence of a gut–lung axis that may explain broader systemic effects. Disruptions in intestinal homeostasis (gut dysbiosis) can increase the translocation of inflammatory mediators, including lipopolysaccharides (LPS) and prostaglandins, into systemic circulation. These mediators may alter immune signaling and down-regulate immune responses. Consequently, strategies that reduce enteric pathogen burden may contribute to improved respiratory outcomes in young calves.

DISCUSSION

It's likely that the greatest near-term economic impact of these results was associated with the reduction in pre-weaning removals, with incoming calves valued at approximately $1,500. Another consideration is that reduction in pneumonia treatments may provide a clearer indicator of improved calf health, as calves were often treated proactively before the full clinical presentation of scours, yet the proactive treatment was recorded as a scour case, which may have obscured potential differences in reported scour incidence.

While this study design reflects real-world conditions and practical applicability of the findings, it also introduces potential imbalances between groups since calves were not randomized based on TP status. Because calves with lower TP are generally at greater risk of morbidity due to reduced passive transfer, the higher proportion of these calves in the treatment group (57%) likely increased the baseline health risk within that cohort. Conversely, the greater proportion of high-TP calves in the control group (60%) likely conferred a natural health advantage. Together, these differences may have narrowed the detectable magnitude of the treatment effect, as the First Defense Technology group contained more calves predisposed to poorer health outcomes while the control group contained more calves likely to perform better due to stronger passive immunity.

For calf ranch operations, these findings are particularly relevant because incoming calves frequently arrive with variable passive transfer status. Managers must decide how to address calves with lower TP levels in ways that support the health of the individual calf while also limiting disease spread across herdmates and minimizing drags on labor efficiency. Administering First Defense Technology in the first milk feeding upon arrival may help mitigate these risks associated with variable passive transfer among incoming calves. For example, in the calves within the lowest TP quartile, odds of any disease intervention for this high-risk group were reduced by 56% with First Defense Technology inclusion in the milk.

CONCLUSION

Providing supplemental pathogen-specific antibodies from bovine colostrum could be an intervention that reduces pathogen shedding pressure from calves with inadequate passive transfer, thereby promoting more uniform health outcomes across cohorts and potentially reducing treatment frequency and associated labor requirements – all important considerations for calf ranches striving to control variability and maximize efficiency.

In addition, the data indicate an additive benefit in calves that arrive with adequate passive transfer. **Overall, calves receiving First Defense Technology hyperimmunized colostrum were approximately half as likely to be removed prior to weaning and had about a 25% lower likelihood of requiring pneumonia treatment,** suggesting that this approach can enhance immune protection beyond baseline maternal immunity while giving calf ranches a tool to minimize variability associated with suboptimal passive transfer.

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