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Evaluation of differing interventions at the onset of neonatal calf diarrhea.

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Introduction

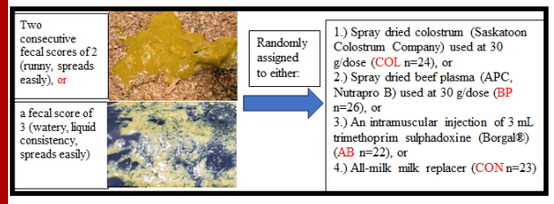
Studies show spray dried plasma reduces disease symptoms when calves are challenged with *E coli* (Nollet, et. al), coronavirus (Arthington, et al), and *C parvum* (Hunt, et al.). Spray dried colostrum has also shown merit during enteric disease challenge (Berge, et. al.). No studies have compared both of these functional protein sources to a common antibiotic regiment to treat diarrhea in young calves.

Objective

The objective of this study was to investigate strategies to treat diarrhea.

Material and Methods

Male calves (n=160) sourced from farms and auctions (BW=52.3 ±4.1 kg) were randomly assigned to receive one of 4 treatment regiments commencing at the on-set of a fecal score of 3 or two consecutive fecal scores of 2 (Renaud, 2020):



Images: courtesy of Veal Farmers of Ontario

⇒ The respective functional protein source was formulated into the non-med, no additive 26:20 all-milk CMR at the expense of milk protein.

⇒ Respective treatment was administered as a substitute for 1 L of the regular CMR for 10 consecutive feedings (5 days) after enrollment in the study.

⇒ If a calf refused his liter of test diet it was tubed, however, if a calf refused his additional feeding of the standard CMR it was recorded as a feed refusal.

⇒ All milk replacer (including test diets) were administered at 130 g solids/L.

CMR was fed 2x/d in a step-up, step-down fashion (37.8 kg over 56 d) starting at 5 L/d for the first 2 weeks. Texturized starter (20% CP, 4% straw) was offered ad lib. Calves were housed individually in a mechanically ventilated grain-fed veal facility in Ontario.

Measures:

⇒ Serum total protein at arrival (refractometer)

⇒ Medical treatments, mortality, milk refusals

⇒ Individual body weight weekly

⇒ Individual fecal score 2x/d (Renaud, 2020)

⇒ Individual respiratory score 2x/d (Love, 2014)

Statistical analysis:

⇒ Conducted in Stata 17 (StataCorp, TX)

⇒ Cox proportion hazard model used to measure mortality and morbidity

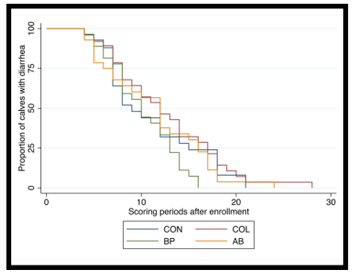
⇒ Linear regression model to evaluate ADG

⇒ Generalized linear model to evaluate fecal and respiratory scores

Results & Conclusion

Of the 160 calves placed, 67.5% experienced sufficient diarrhea symptoms to enter the study. No differences were found between treatment groups with regard to source (P=0.25), crossbred calves (n=5, P=0.47, the balance were Holstein), serum total protein (P=0.27), incidence of failed transfer of passive immunity (38.9% of all calves; P=0.17), or mean days from arrival to enrollment (5.1 ±1.7 d; P=0.92). Using a log-rank test of survivor function there was no differences in mortality (P=0.76).

Figure 1. Kaplan Meier Survival Curve of Resolution of diarrhea over the experimental period by treatment group



Conclusions:

- No statistical differences in ADG or mortality
- Bovine plasma group tended faster resolution of diarrhea vs. control and significantly ↓ number of calves requiring 2nd scour treatment
- Antimicrobial group tended ↓ 1st treatment for respiratory disease and significantly fewer calves requiring 2nd treatment for respiratory
- Antimicrobial group ↑ 42 d body weight vs. control
- Approximate cash outlay (US$): 300 g Saskatoon Colostrum Powder $22.40, 300 g APC Nutrapro B plasma $1.65; 15 ml Borgal® trimethoprim sulphadoxine $1.12. Additional protein value of 159 and 234 g from colostrum and plasma respectively. Colostrum also provides 63 g of fat.

Possible follow-up studies:

- Supplement functional protein prior to diarrheic event
- Increase functional protein dose

	COL	BP	AB	CON
Number (n) of calves enrolled	28	27	28	25
Enrollment (diarrhea onset) growth day	5	5	5.3	5.1
Mortality (n)	2	2	4	3
Arrival Serum Total Protein (g/dL)	5.17	5.16	5.42	5.28
Trimethroprim sulfa (% 1st scour treat)	89.3%	81.5%	100%	84.0%
Of diarrhea treated, % 2nd treat	12%^{a}	0%^{b}	28.6%^{a}	14.3%^{a}
% treated for respiratory disease	67.9%^{x}	63%^{x}	42.9%^{y}	64%^{x}
Of Respiratory treated, % 2nd treat.	63.2%^{a}	79%^{a}	25%^{b}	58.8%^{a}
Of Respiratory treated 2x, % 3rd treat	75.0%	53.3%	100.0%	50.0%
Body weight (BW) at enrollment (kg)	52.7	52.3	52.4	52.2
42-d post enrollment BW (kg)	79.1^{a}	79.9^{a}	83.1^{b}	79.7^{a}
56-d post enrollment BW (kg)	95.9	96.3	98.5	96.3
28-d ADG post enrollment (kg)	0.58 ±0.17	0.53 ±0.16	0.61 ±0.20	0.58 ±0.13
56-d ADG post enrollment (kg)	0.77 ±0.24	0.79 ±0.29	0.83 ±0.20	0.79 ±0.24

^{a,b}Means within a row different superscripts differ ($P \leq 0.05$)

^{x,y}Means within a row different superscripts differ ($P \leq 0.10$)

Treatment groups in study (130 g/L). Calves were enrolled at barn placement and treatment administered at on-set of diarrhea (2 days fecal score 2 or 1 day fecal score 3):
COL: CMR formulated to 26% CP & 20% fat with spray dried colostrum (Saskatoon Colostrum Company) included at 23% of formula (30 g/fdg)
BP: CMR formulated to 26% CP & 20% fat with spray dried bovine plasma (APC, Nutrapro B) included at 23% of the formula (30g/fdg)
AB: CMR formulated to 26% CP & 20% fat with no functional proteins + intramuscularly injection of trimethroprim sulphadoxine (Borgal®) at a dose of 3 mL/45 kg 1x/d for 5 consecutive days
CON: CMR same as AB treatment group but no antibiotic

Cox proportional hazard model evaluating resolution of diarrhea (defined as a return to two consecutive fecal scores of 0 or 1)			
Treatment group	Hazard ratio	P	95% Conf. Int.
CON	Referent		
COL (Colostrum)	0.95	0.87	0.53 to 1.71
BP (bovine plasma)	1.65	0.09	0.93 to 2.94
AB (antibiotic)	1.12	0.69	0.63 to 1.98

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