The effects of DFM plus tannins on measures of immunity and growth performance of weaned beef calves

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Abstract

A two-year study was conducted to determine the effects of direct-fed microbials plus tannins (DFM + TN) on weaned calf performance and indicators of innate immune response. Angus calves (n = 142 year 1; 143 year 2) were weaned at 6 months of age, transferred to a feedlot, and fed one of two diets for 42 days: a ration with added DFM + TN (2×10^8 *Propionibacterium acidipropionici*; 5×10^7 CFU/hd/day *Lactobacillus acidophillus*; 5×10^7 CFU/hd/day *Bifidobacterium animalis; and tannins* 15 g/hd/day) or a ration with no added DFM +TN (CON). Body weights were taken on consecutive days and averaged at the beginning and ending of the study, while single day weights were taken on d 14, and 28. Upon completion of the feeding study (year 2), calves (n = 72) were transported to Laramie, WY (204 km) where blood samples were taken on d 0, 2, 4, 7, and 9 relative to transportation to measure plasma haptoglobin. Data were compared among groups using a categorical response mixed model. The model included the fixed effect of treatment group and the data were measured repeatedly. DFM + TN calves had lower overall (P = 0.001) F:G and tended to have greater ADG (P = 0.15) and lower F:G (P = 0.12) during the first 28 days and greater overall ADG (P = 0.06) and greater (P = 0.11) total gain overall. There was a tendency (P = 0.09) for a treatment x day effect for DFM + TN calves to have lower plasma haptoglobin concentration on day 0 and 4 than CON calves. Weaned calves fed DFM + Tannins tended to have greater growth performance during the first 42 days post weaning and tended to have a reduction in plasma haptoglobin concentrations, suggesting a reduction in stress and a positive impact on calf growth.

Background

Weaning is an extremely stressful phase of livestock production affecting physiological, metabolic, endocrinological, and behavioral processes (Weary et al., 2008). The stressors are derived from the abrupt separation of the calf from its dam, nutritional adjustments, and vaccinations (Lynch et al., 2010). Several feed additives have been developed to attenuate the periods of stress in animals. Among the additives currently used are the direct-fed microbials (DFM) described as feed products that contain a source of live, naturally occurring microorganisms (FDA, 2015). Another class of natural additives are the tannins, which are a complex group of polyphenolic plant secondary compounds.

References

FDA. Direct-Fed Microbial Products in Compliance Policy Guides. Washington, D.C, 2015.

Lynch EM, Earley B, McGee M, Doyle S (2010) Effect of abrupt weaning at housing on leukocyte distribution, functional activity of neutrophils, and acute phase protein response of beef calves. *BMC Veterinary Research* **6**, 39.

Weary DM, Jasper J, Hötzel MJ (2008) Understanding weaning distress. *Applied Animal Behaviour Science* **110,** 24-41.

Methods

Weaned Angus calves (n = 142 in year 1; 143 in year 2) were immediately transferred to the feedlot (Lingle, WY), processed, randomly assigned to 16 pens, and fed one of two diets for 42 days: a receiving ration (CON) or receiving ration with DFM (2×10^8 CFU/hd/d *Propionibacterium acidipropionici*; 5×10^7 CFU/hd/d *Lactobacillus acidophillus*; 5×10^7 CFU/hd/d *Bifidobacterium animalis)* and condensed + hydrolyzed tannins blend (15 g/hd/d). The composition of the basal diet offered during the 42 d receiving trial (both years) is shown in Table 1. Body weights were taken on two consecutive days and averaged at the beginning and ending of the study, while single day weights were taken on d 28. Upon completion of the 42-d study (year 2 only), calves (n = 72) were transported to Laramie, WY (242 km for 3 h), where blood samples were taken on d 0, 2, 4, 7, and 9, relative to transportation, to measure plasma haptoglobin concentrations. Calf performance and immune response data were analyzed as a completely randomized design (Mixed Procedures of SAS).

Table 1. Ingredients and chemical composition of the total mixed ration (TMR) offered calves during year 1 and year 2 receiving trials.

Item	TMR
Ingredients (g/kg DM)	
Cracked corn	500
Alfalfa hay	200
Corn silage	300
Chemical composition (dry basis)	
Dry matter, %	66.8
Crude protein, %	11.0
ADF[a], %	23.6
Calcium, % Ca	0.74
Phosphorus, % P	0.28
Net Energy Maint, MCal /Kg*	1.61
Net Energy Gain, MCal /Kg*	1.00

[a]ADF- Acid detergent fiber;

Results

Table 2. Growth performance parameters (least squares means ± standard error of means) of calves offered a receiving ration without (CON) or with added DFM and tannins (DFM+TN).

	CON	DFM +TN[1]	S.E.M[2]	P – Value
Initial BW (Kg)	248.3	248.9	4.6	0.42
Final BW (Kg)	298.2	301.8	5.07	0.43
Overall gain (Kg)	49.9	52.9	0.77	0.11
ADG[3] (kg/day)	1.19	1.26	0.02	0.06
DMI[4] (kg/day)	6.48	6.30	0.25	0.31
F:G[5]	5.50	5.00	0.09	0.001

[1]Direct fed microbial and tannins; [2]standard error of means; [3]average daily gain; [4]dry matter intake (calculated from each pen (n = 8 pen/treatment per year), but divided by the number of cattle within each pen (n = 9 head/pen) and expressed as kg per animal/d); [5]feed:gain ratio (calculated using total DMI and BW gain of each pen and expressed as kg per animal/d)

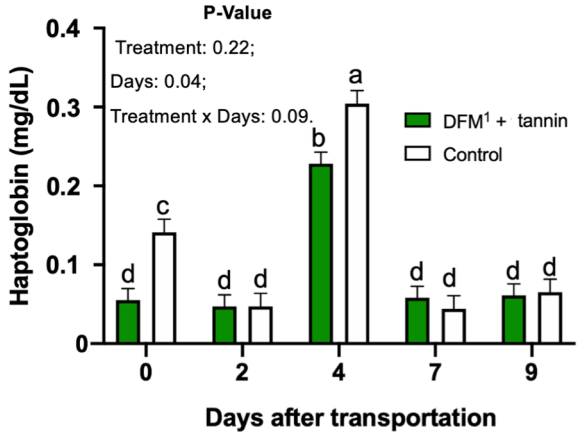

Figure 1. Serum haptoglobin concentrations of calves offered a receiving ration with added DFM and Tannins (DFM[1]+TN) or without (CON)

Conclusion

Weaned calves fed DFM + tannins exhibited an improved feed: gain with trends toward increased ADG and decreased plasma haptoglobin during 42 and 46 days post weaning, respectively, thereby suggesting a reduction in stress and a positive impact on calf growth.