College of Agricultural, Consumer and Environmental Sciences

CLAYTON LIVESTOCK RESEARCH CENTER

15 NMSU Lane Clayton, New Mexico 575-374-2566

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Novel nasal inoculant and feed probiotic did not affect health and performance of feedlot receiving calves

E. R. Oosthuysen, M. E. Hubbert, M. E. Garcia, M. R. Garner, and C. A. Löest

Use of antibiotic feed additives is common practice to optimize production efficiency in the feedlot cattle industry. The Food and Drug Administration is implementing a voluntary plan for the livestock industry to phase out certain antibiotics (FDA, 2013). Also, recent research from Yale University and the University of Connecticut reported detecting genes relating to bacterial resistance to antibiotics in the manure of cattle (Wichmann et al., 2014). Therefore, use of alternative natural products to replace antibiotic feed additives warrants investigation. This study evaluated the effects of a novel nasal inoculant and feed probiotic on performance and health of feedlot receiving calves.

All procedures were approved by the Institutional Animal Care and Use Committee at New Mexico State University. Six hundred and fifty nine crossbred calves (initial body weight of 416 lb) in 6 truckloads (104 to 114 calves per truckload) were received on different days at the Clayton Livestock Research Center. At initial processing, all calves were weighed, vaccinated against infectious bovine rhinotracheitis, bovine viral diarrhea, bovine respiratory syncytial virus, and parainfluenza-3 virus, dosed with an internal and external parasiticide, and given metaphylactic antibiotic treatment. Upon completion of initial processing all calves were assigned to 48 pens and 4 treatments. Treatments were no feed probiotic (-PROB) or a novel feed probiotic (+PROB) in a factorial arrangement with no nasal inoculant (-NASAL) or a novel nasal inoculant (+NASAL).

Both the nasal inoculant and the feed probiotic were bacterial mixtures of *Enterococcus faecium* (EF510), *Lactobacillus acidophilus* (LA210), and *Pediococcus acidilacticii* (PA910) to supply 2×10^7 colony forming units per bacterium for each calf daily. Pens of calves assigned to +NASAL received a 5-mL spray of a gelatinous solution containing the bacterial mixture in each nasal cavity upon initial processing on day 0, and pens of calves assigned to +PROB received a diet (Table 1) top-dressed with the bacterial mixture from day 0 to 56. Pen of calves were weighed on day 0, 28, and 56, and morbidity was recorded throughout the experiment.

Average daily gain (Table 2) of calves tended to be lower for +NASAL than –NASAL when receiving no feed probiotic (–PROB), and tended to be lower for –NASAL than +NASAL when receiving the feed probiotic (+PROB). Percentage of calves pulled for signs of morbidity were greater for +NASAL than –NASAL (10.9 vs. 7.5%) when receiving no feed probiotic (–PROB), and were greater for –NASAL than +NASAL (14.7 vs. 8.1%) when receiving the feed probiotic (+PROB). Morbidity of calves receiving both +NASAL and +PROB was not different to morbidity of calves receiving no inoculant (-NASAL) and no probiotic (-PROB). Overall mortality was 0.45%.

In summary, lower average daily gain was consistent with a lower dry matter intake associated with morbid calves. The novel nasal inoculant and feed probiotic did not improve performance and health of feedlot receiving calves. Limited response to the nasal inoculant and feed probiotic could be due to insufficient doses of the bacterial mixture, and(or) due to metaphylactic antibiotic treatment and low incidences of morbidity and mortality.

References

Wichmann, F., N. Udikovi-Kolic, and S. Andrew. 2014. Diverse antibiotic resistance in dairy cow manure. mBio vol. 5 no. 2 e01017-13.

FDA. 2013. Phasing out certain antibiotic use in farm animals. Consumer updates. Available: http://www.fda.gov/forconsumers/consumerupdates/ucm378100.htm. Accessed February 25, 2014.

Table 1. Composition of diets (DM basis)

Item	Diets	
	Day 0 to 28	Day 29 to 56
Ingredient, %		
Wet corn gluten feed	43.31	34.08
Corn grain, cracked	17.36	33.69
Corn distiller's grains	17.64	17.78
Corn stover	14.71	11.89
Limestone	2.32	1.98
Urea	0.34	0.52
Salt	0.27	0.26
Mineral Supplement	0.18	0.12
Medical Supplement	0.05	0.03
Vitamin Supplement	0.04	0.01
Nutrient		
CP, %	21.4	19.2
NE_m, Mcal/kg	1.75	1.79
NE_g, Mcal/kg	1.13	1.16

Table 2. The effects of nasal inoculant and feed probiotic on performance and health of feedlot receiving calves

	Treatments[1]				
	-NASAL		+NASAL		
Item	**-PROB**	**+PROB**	**-PROB**	**+PROB**	**SEM**
Pens[2]	12	12	12	12	
BW, lb					
day 0	417.1	416.7	419.6	414.5	3.14
day 28	457.6	451.4	455.4	454.5	4.12
day 56	548.5	544.1	543.2	544.3	4.77
ADG, lb/day					
day 0 to 28	1.44	1.24	1.28	1.43	0.17
day 28 to 56	3.24	3.30	3.13	3.21	0.17
day 0 to 56	2.34	2.27	2.20	2.31	0.07
DMI, lb/day					
day 0 to 28	8.88	8.71	8.60	8.83	0.17
day 28 to 56	14.75	14.40	14.08	14.28	0.29
day 0 to 56	11.81	11.54	11.33	11.56	0.19
Feed to Gain ratio					
day 0 to 28	6.16	7.02	6.72	6.17	1.16
day 28 to 56	4.55	4.36	4.50	4.45	0.23
day 0 to 56	5.04	5.08	5.15	5.00	0.09
Morbidity[3], %					
First pull	7.01	13.01	9.86	8.14	3.27
Total pulls	7.52	14.70	10.94	8.06	3.62

[1]Treatments were a 2 × 2 factorial arrangement of a novel nasal inoculant not given (-NASAL) or given (+NASAL) to calves during initial processing on day 0, and a novel feed probiotic not added (-PROB) or added (+PROB) to the diets during the 56-day study.

[2]Soil-surface pens with 13 to 15 calves per pen.

[3]First pull = percentage of cattle pulled once for medical treatment; Total pulls = percentage of total pulls (first and second pulls combined) for medical treatment. Mortality was not analyzed statistically because only 3 calves died during the 56-day study.