



Evaluation of *Bacillus subtilis* PB6 to improve feedlot steer performance

Newly received cattle in a feedlot setting face a host of stressors including: transportation, weaning, environmental changes, and commingling. These stressors can compromise the immune system of calves and lead to illness. Traditionally, antibiotics have been the sole solution implemented to address the challenges of these stressors. In recent years, due to pressure from consumers and concerns with future antibiotic resistance, the cattle feeding industry has begun to reduce their usage of antibiotics. As a result, the use of direct fed microbials (DFM) has become more common within commercial feedlots. It has been found that the use of DFM during the receiving period may be advantageous if the DFM can improve performance¹.

A feedlot setting study was conducted at Willard Sparks Beef Research Center in Stillwater, OK to evaluate the supplementation of the active microbial *Bacillus subtilis* PB6 (PB6) on feedlot steer performance when administered in the feed at 13g/hd/day to provide 9,500,000 CFU/g.

Materials and Methods

In the fall, 397 calves were received from Florida ranches. Upon arrival and prior to being processed, the steers were weighed, individually ear tagged and allowed a rest period of 24 to 48 h. On d 0 of the experiment, steers were administered a **clostridial bacterium/toxid** (Vision[®] 7 with Spur[®]; Merck Animal Health, DeSoto, KS) and were treated for external (StandGuard[®]; Elanco Animal Health, Greenfield, IN) and internal (Safe-Guard[®]; Merck Animal Health) parasites, along with receiving an implant (Revalor[®]-IS; Merck Animal Health). Steers were assigned to a control treatment or a PB6 treatment group (12 pens/treatment; 15-20 hd/pen). The steers were re-implanted (Revalor[®]-200; Merck Animal Health) on d 28 of finishing. Lastly, the steers were fed ractopamine hydrochloride (Optaflexx[®]; Elanco Animal Health) at a calculated rate of 300mg/hd/d for the last 28 d of the trial (d 141 to d 169 finishing) and underwent a 48 h ractopamine hydrochloride withdraw prior to slaughter.

The control treatment was a top-dressed supplement which contained ground corn and wheat middlings fed at a rate of 0.5 lb/hd/d. The PB6 treatment was also a top-dressed supplement fed at 0.5 lb/hd/d and designed to provide 9,500,000 CFU/g of PB6. Diets were formulated to meet or exceed all nutrient requirements for receiving and finishing steers (NASEM, 2017).

Performance Impacts

Effects of feeding PB6 active microbial on receiving and finishing feedlot steer performance are shown in Tables 1 and 2. Throughout the receiving and finishing period, there were no differences in final body weight (BW), dry matter intake (DMI) or average daily gain (ADG). However, the PB6 steers did have a tendency for improved feed efficiency (F:G) over the entire finishing period.

Table 1: Effects of feeding PB6 active microbial on receiving feedlot steer performance¹.

Item ²	Treatment ⁴		SEM	P-value
	Control	PB6		
BW ³ , lbs				
d 0	556	556	13.1	0.78
d 60 ⁴	753	752	14.1	0.97
ADG, lbs				
d 0 - 60	3.27	3.28	0.06	0.91
DMI, lbs				
d 0 - 60	18.0	18.0	0.31	0.77
F: G				
d 0 - 60	5.52	5.48	0.09	0.78

¹Fed a supplement at 0.5 lb/hd/d containing corn and wheat middlings (control) or the control with added PB6 to provide 9,500,000 CFU/g.

²Data are presented on a dead out basis. For the feed intake data, animals were removed at calculated maintenance intake.

³All body weights were shrunk by 4%.

⁴Final receiving BW was recorded on d 61 for group 1 (trucks 1 and 2), d 60 for group 2 (trucks 3 and 4), and d 57 for group 3 (truck 5).



Table 2: Effects of feeding PB6 active microbial on finishing feedlot steer performance¹

Item ²	Treatment ⁵		SEM	P-value
	Control	PB6		
BW ³ , lbs				
d 60 ⁴	753	752	14.1	0.97
d 230 ⁵	1319	1327	15.5	0.40
ADG, lbs				
d 200 - 230 ⁶	3.53	3.58	0.10	0.74
d 60 - 230	3.33	3.38	0.03	0.25
d 0 - 230	3.32	3.35	0.03	0.33
DMI, lbs				
d 200 - 230 ^{5,6}	26.2	25.7	0.30	0.15
d 60 - 230	23.8	23.6	0.29	0.46
d 0 - 230	22.2	22.1	0.27	0.48
F:G				
d 200 - 230 ^{5,6}	7.50	7.24	0.21	0.36
d 60 - 230	7.15	7.00	0.07	0.07
d 0 - 230	6.69	6.58	0.06	0.09
HCW ⁷ , lbs	850	852	10.1	0.58

¹Fed a supplement at 0.5 lb/hd/d containing corn and wheat middlings (control) or the control with added PB6 to provide 9,500,000 CFU/g.

²Data are presented on a deads out basis. For feed intake animals were removed based on pen average intake by period.

³All body weights were shrunk by 4%.

⁴d 0 of finishing was d 61 for group 1 (trucks 1 and 2), d 60 for group 2 (trucks 3 and 4), and d 57 for group 3 (truck 5).

⁵Final = Total d on study; 231 d for Group 1 (Trucks 1 & 2), 230 d for Group 2 (trucks 3 & 4), and 227 d for Group 3 (truck 5).

⁶A beta agonist (Optaflexx[®]; Elanco Animal Health, Greenfield, IN) was fed during this period at a calculated 300mg/hd/d. There was a 48 h withdraw before slaughter.

⁷HCW = hot carcass weight.

Conclusion

The single-sourced, naïve steers utilized in this trial experienced processing upon arrival at the Willard Sparks Beef Research Center. Numerous tendencies for F:G existed for the PB6 fed steers, indicating the PB6 fed steers were more efficient during the finishing period, and overall (receiving and finishing).

The multitude of stressors newly received feedlot cattle experience can have direct implications to overall intestinal integrity, gut health and animal performance. There is a general consensus that a healthy gut leads to a healthy animal with optimal performance. Lowering the intestinal pathogen load during these stressful times helps to maintain a healthy gut microflora and may limit the performance impacts of pathogens including *Clostridium*, *Salmonella* and *Escherichia coli*.

Supplementing PB6 active microbial at 9,500,000 CFU/g proved to be an effective strategy to improve feed efficiency in single-sourced, naïve feedlot cattle.

References

1. Duff, G. C. and M. L. Galyean 2007. Board-invited review: Recent advances in management of highly stressed, newly received feedlot cattle. *J. Anim. Sci.* 85: 823-840.