EXTENSION
BEEF CATTLE RESEARCH UPDATE
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Effects of Metaphylaxis on Production Responses and Total Antimicrobial Use in High-Risk Beef Calves

Shipping fever, or bovine respiratory disease complex (BRD), is the most common morbidity and mortality event among feedlot cattle in the United States.[1] BRD accounts for approximately 75% of morbidity[2] and 50 to 70% of mortality in feedlots.[3] Metaphylaxis is the on-arrival, preventative mass medication of antimicrobial therapy for the control of BRD. Both ceftiofur crystalline free acid (Excede, Pfizer Animal Health, New York, NY) and tilmicosin phosphate (Micotil, Elanco Animal Health, Indianapolis, IN) are labeled for control of BRD associated with the implicated pathogens. A 2007 review of nearly 150 papers on the subject of highly stressed, newly received cattle concluded that metaphylactic antibiotic programs is an effective means of decreasing BRD incidence in stressed, newly received calves.[4] Although metaphylaxis by reducing morbidity helps to achieve sustainability goals related to animal well-being, it is often considered to be in conflict with goals of judicious antimicrobial application. Hence, Texas A&M University research evaluated the effects of metaphylaxis for control of BRD on measures related to sustainability, including health, antibiotic use, and productivity.[5]

In this study, 198 male calves (24 bulls and 174 steers, 509 lb) were purchased from an order buyer and shipped to the Texas A&M AgriLife Research Beef Cattle Systems Research Unit in Burleson County, Texas. Within arrival group, the cattle were stratified by weight and randomly assigned to 1 of 6 pens (16 or 17 head per pen), and pens were randomly assigned to 1 of 3 treatments for a total of 12 pens (6 per arrival group block) and 4 replications per treatment. The treatments were non-treated cattle (Controls) or mass medication with Excede (1.5 mL/100 lb BW) or Micotil (2.0 mL/100 lb BW). The cattle were observed daily and treated according to clinical presentation of BRD and weighed every 14 days over a 42-day receiving period. Feed intake and total antimicrobial use were recorded.

These researchers reported that morbidity due to respiratory disease was reduced by 25.2% for cattle receiving metaphylaxis relative to those receiving no metaphylactic therapy (P = 0.01; 51.5 vs. 76.7% (Table1). No differences (P = 0.14) were observed between Micotil (46.4%) and Exceed (56.5%). An average of 23.8% of the cattle receiving metaphylaxis required a second treatment compared with 36.3% of those in the CON treatment group (P = 0.12), and 7% of cattle in metaphylaxis treatments and 15% of control cattle required a third antibiotic treatment (P = 0.16). The average time to first pull was 5 days greater in cattle given metaphylaxis compared with Controls (10 vs. 5 days; P < 0. 01). The Micotil cattle required treatment 4 days before Exceed (P = 0.02, 8 vs. 12 d).

Table 1. Morbidity and average number of days (after arrival) until first pull

	Treatment[1]			Contrast P-value[2]	
Item	CON	EXC	MIC	CON vs. TRT	EXC vs. MIC
Morbidity, %	76.7	56.5	46.4	0.01	0.14
Calves treated					
Twice,[3] %	36.3	29.7	17.9	0.12	0.19
Thrice, [3] %	15.3	12.7	1.4	0.16	0.11
Days to first pull[4]	5	12	8	0.01	0.02

[1]CON = no metaphylaxis at arrival; EXC = Excede at arrival; MIC = Micotil at arrival.
[2]Contrast P-values: CON vs. TRT = control vs. EXC plus MIC.
[3]Calves treated twice or thrice. Includes calves treated for BRD symptoms only.
[5]Days to first pull = average number of days until an animal required BRD treatment. EXC and MIC groups underwent a 3-day moratorium following metaphylactic treatment on study days 0.
Adapted from Word et al. 2020.

They also reported that performance differences were limited between groups. During the first 14 days, gains (3.59 vs. 2.82 lb/day; P = 0.06) and Gain:Feed ratio (0.29 vs. 0.22; P = 0.01) were greater for cattle given metaphylaxis than for the controls with no differences between Excede and Micotil (P > 0.40). However, no differences in performance occurred over the entire 42-day feeding period.

It was noted that aggregate antibiotic use in food animals is often reported on a mass basis.[6] Total antimicrobial use was similar for Controls versus metaphylaxis (6.03 vs. 6.16 grams of active ingredient per animal: P = 0.88), and for Micotil versus Excede (5.99 vs. 6.33 grams; P = 0.74). In this study, Controls received an average of 1.28 therapeutic applications per animal enrolled, compared with an average of 0.82 for metaphylaxis groups. However, when considering the metaphylactic application (received by all animals within the defined group), the number of antimicrobial applications increases to 1.82 for animals receiving metaphylactic treatment.

These authors concluded that metaphylaxis improved animal well-being by reducing overall morbidity rates and total number of days that animals experienced clinical illness. The total number of antimicrobial applications was higher but total mass of antimicrobial use was similar when metaphylaxis was applied in calves with high initial morbidity rates. These "results suggest that use of metaphylaxis is consistent with goals commonly expressed as elements of sustainable production systems, including improved animal well-being, judicious use of pharmaceutical products, and maintenance of productivity".

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[1] USDA-APHIS (2013). Pages 18 in Feedlot 2011 Part IV: Health and Health Management on U.S. Feedlots with a Capacity of 1,000 or More Head. USDA–APHIS–Veterinary Services, Fort Collins, CO.

[2] Edwards, A. J. 1996. Respiratory diseases of feedlot cattle in the central USA. Bovine Practitioner 30:5–7.

[3] Loneragan, G. H., D. A. Dargatz, P. S. Morley and M. A. Smith. 2001. Trends in mortality ratios among cattle in US feedlots. J. Am. Vet. Med. Assoc. 219: 1122-1127.

[4] 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.

[5] Word, A. B., T. A. Wickersham, L. A. Trubenbach, G. B. Mays and J. E. Sawyer. 2020. Effects of metaphylaxis on production responses and total antimicrobial use in high-risk beef calves. Appl. Anim. Sci. 36: 265-270.

[6] FDA. 2018. 2017 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals. US Food Drug Admin. Center Vet. Med., Washington, DC.