Research Notes

Passport Food Safety Solutions

BoviBrom delivers effective bacterial control in spray chill application.

Research confirms efficacy in pathogen reduction.

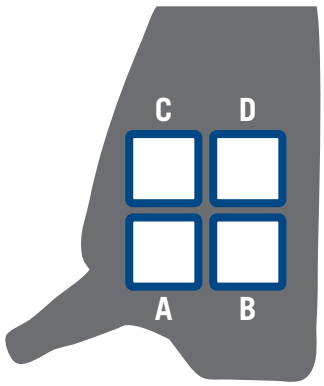
INTRODUCTION

Utilizing antimicrobial applications in the spray chill is increasingly being recognized as a beneficial practice in the U.S. beef packing industry. The procedure involves intermittently spraying carcasses with a mixture of chilled water and an antimicrobial agent during the first 8 – 16 hours of chilling. There are several antimicrobials currently used in the U.S. to help reduce bacterial loads on carcasses.[1]

Historically, research has demonstrated the chilling process is an area where significant bacterial growth can occur.[2] Recent industry data has demonstrated that bacterial growth or contamination during the chilling process continues to occur today and suggests that processors would realize significant benefits from an effective intervention during carcass chilling.

A third-party research trial conducted by Colorado State University was designed to evaluate the efficacy of BoviBrom® antimicrobial compound on bacterial growth when used as a spray chill application in beef packing facilities.[3]

FIGURE 1: Zone locations for beef carcasses



STUDY DESIGN

- Carcasses were inoculated on the rail in lower target zones A and B, while target zones C and D remained uninoculated to allow for comparison of BoviBrom application to the carcasses' natural microflora (Fig. 1)
- The inoculum consisted of a five-strain mixture of non-pathogenic *E. coli* biotype 1, which are considered surrogates for pathogenic *E. coli* and *Salmonella*
- The following treatment systems were administered (Table 1):

TABLE 1 Treatment and sampling scheme for inoculated beef carcasses

Treatment Systems	Inoculated Zones		Uninoculated Zones	
	Sample: Zone A	Sample: Zone B	Sample: Zone C	Sample: Zone D
1 (Low Concentration – 168 ppm)	Before BoviBrom application	After BoviBrom application	Before BoviBrom application	After BoviBrom application
2 (High Concentration – 353.5 ppm)	Before BoviBrom application	After BoviBrom application	Before BoviBrom application	After BoviBrom application

- Treatments were administered to 20 separate carcasses (40 sides), with two individual test days conducted for each respective treatment
- Inoculated samples were analyzed for *Enterobacteriaceae* (EB) counts, and uninoculated samples were analyzed for aerobic plate counts (APC) and EB counts

RESULTS

- In treatment 1, BoviBrom® applied at a low concentration in the spray chill reduced EB counts by 1.2 log CFU/cm^2 (P<0.05) in inoculated zones (Table 2)
- In treatment 2, BoviBrom applied at a high concentration in the spray chill reduced EB counts by 1.1 log CFU/cm^2 in inoculated zones (P<0.05) (Table 2)

TABLE 2 Least-squares means estimates of *Enterobacteriaceae* counts (log CFU/cm^2) for inoculated (non-pathogenic *Escherichia coli* biotype I, serving as surrogates for pathogenic *E.coli* and S*almonella enterica*) zones of beef carcasses before and after BoviBrom in a spray chill system.

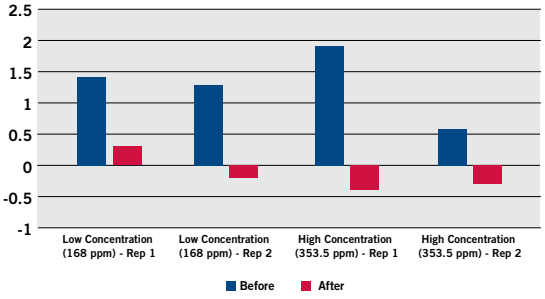
Treatment	Before	After	Difference between before/after
Low concentration—168 ppm (n = 40)	6.4^a (0.0)[1]	5.2^b (0.0)	1.2
High concentration—353.5 ppm (n = 40)	6.3^a (0.0)	5.2^b (0.0)	1.1

[1] Standard error

^{a,b} Means with different superscripts within a row are different (P<0.05)

- In uninoculated zones, low-concentration BoviBrom reduced EB counts by >1.1 log CFU/cm^2 and >1.5 log CFU/cm^2 on treatment days 1 and 2, respectively (P<0.05) (Fig 2)
- In uninoculated zones, high-concentration BoviBrom reduced EB counts by >2.3 log CFU/cm^2 and >0.9 log CFU/cm^2 on treatment days 1 and 2, respectively (P<0.05) (Fig 2)
- After BoviBrom application, 20% and 45% of the uninoculated zones sampled demonstrated EB counts below the analysis detection limit, and APC of uninoculated zones was reduced by >1.2 log CFU/cm^2 (P<0.05)
- After BoviBrom application, APC of uninoculated zones were reduced by >0.7 log CFU/cm^2 (P<0.05)

FIGURE 2: Reduction in EB counts on uninoculated carcasses before and after BoviBrom spray chill



ADDITIONAL SUPPORTING DATA

A third-party research trial conducted by Colorado State University was designed to evaluate the efficacy of BoviBrom antimicrobial compound on bacterial growth when used in multiple interventions in beef packing facilities[4] (Table 3). Across treatments, BoviBrom effectively reduced EB counts in the spray chill, indicating that regardless of existing treatment system, BoviBrom can be an effective addition to the spray chill.

TABLE 3

TREATMENT	EB COUNT REDUCTION
1*	>1.8
2**	1.0
3***	>1.7

* Treatment 1: Hot water wash → Lactic Acid Spray → BoviBrom spray chill

**Treatment 2: BoviBrom final wash → Lactic Acid Spray → BoviBrom spray chill

***Treatment 3: BoviBrom + hot water wash → Lactic Acid Spray → BoviBrom spray chill

CONCLUSIONS

- Application of BoviBrom in a spray chill system effectively controlled inoculated populations of pathogenic *E. coli* and *Salmonella* surrogates as well as natural microflora
- In a multi-intervention program, BoviBrom can effectively reduce microbial counts in the spray chill

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1 Savell JW. Beef Carcass Chilling: Current Understanding, Future Challenges. Cattlemen's Beef Board and National Cattlemen's Beef Association. 2012.

2 Ruby JR, et al. Using Indicator Bacteria and *Salmonella* Test Results from Three Large Scale Beef Abattoirs Over an 18-Month Period to Evaluate Intervention System Efficacy and Plan Carcass Testing for *Salmonella*. *Journal of Food Protection* 2007;70(12):2732-2740.

3 Davis HE, et al. Validation of 1,3-dibromo-5,5-dimethylhydantoin as an antimicrobial intervention in a spray chill system in a commercial beef harvest operation. Center for Meat Safety and Quality, Department of Animal Sciences. Colorado State Univ. 2017.

4 Bullard BR, et al. Investigation of the use of 1,3-Dibromo-5,5-Dimethyl hydantoin (DBDMH) in beef harvest interventions. Center for Meat Safety and Quality, Department of Animal Sciences. Colorado State Univ. 2018.