

Effect of a Formaldehyde-based Feed Sanitizer on the Control of Necrotic Enteritis in Broiler Chickens

C. M. Selby¹, N. Holcombe¹, C. Schaeffer¹, D. Moore², and E. Montiel¹

¹Anitox Corporation, 1055 Progress Circle, Lawrenceville, GA 30043, USA ² Colorado Quality Research, 400 E Colorado RD 72, Wellington, CO 80549

Abstract

Necrotic Enteritis (NE) is one of the most economically harmful diseases to the poultry industry. This disease, caused by the bacterium, *Clostridium perfringens*, is ubiquitous with the environments in which commercial poultry are reared. Because the pathogen is a natural habitant of the GI tract of poultry, predisposing factors that favor *C. perfringens* growth are often associated with the pathogen's ability to produce NE in broilers. Antibiotic-growth promoters (AGP) were previously utilized to control NE in chickens. However, with recent bans on AGP usage, other prevention strategies are being investigated. The use of a feed sanitizer to control or prevent NE in broiler chickens has not previously been studied. Feed sanitizers have been utilized for decades to reduce the colonization of pathogenic bacteria stemming from feed ingredient contamination. In the present study, broiler chickens were vaccinated against coccidiosis on day-of-hatch and challenged with *C. perfringens* on d17. Birds were fed a starter, grower, or finisher diet sanitized with Termin-8, a formaldehyde + propionic acid + terpene-based feed sanitizer. Under challenge conditions, broiler body weight gain was significantly ($P<0.0001$) increased in birds fed a sanitizer diet versus those fed a control diet. Significant reductions in feed conversion ($P<0.0001$), mortality ($P<0.0001$), oocyst shedding ($P=0.0001$), and NE lesion scores ($P=0.0014$) were also observed in broilers fed a sanitized diet under challenge conditions. These data suggest that feeding broiler chickens a diet sanitized with Termin-8 feed sanitizer can reduce the impact of NE, further increasing performance and livability in broiler chickens.

Introduction

Necrotic enteritis (NE), caused by the bacterium *Clostridium perfringens*, has been described as one of the most economically harmful diseases within the poultry industry (Hofacre, 2011; Cooper et al., 2013). Infections of NE have been associated with high mortality and reductions in performance due to the necrosis of the intestinal mucosa (Timbermont et al., 2011).

Feed sanitizers have shown to reduce the pathogenic load entering the gastrointestinal tract via feed, reducing the onset of enteritis in commercial poultry (Ricke, 2005; Ricke, 2017). As *C. perfringens* has been isolated from feed, the use of a feed sanitizer could be a potential mitigation strategy that has not been previously investigated. The current study was conducted to evaluate the effect of Termin-8, a formaldehyde + propionic acid + terpene-based feed sanitizer, on the prevention and control of NE in broiler chickens.

Materials and Methods

The current study was conducted at Colorado Quality Research, Wellington CO.. On day of hatch 1,600 Cobb 500 chicks were weighed, administered a 1x coccidiosis vaccine, randomly allocated into treatment groups, and begin respective experimental diets (Table 1).

Birds were weighed by group on days 0, 17, 21, 28, and 35. Feed intake was measured on days 17, 21, 28, and 35. Birds were provided respective diets and water *ad libitum* from d0-35 (end of study). Average BW, BWG, and adjusted FCR were calculated on days 17, 21, 28, and 35. Birds were challenged with 4.7×10^8 CFU/mL *Clostridium perfringens* on d17 via feed and evaluated for NE lesion scores and oocyst shedding on d21.

Analysis. The current study was conducted as a randomized complete block design with 5 treatments. The pen was considered the experimental unit for all outcomes. BW, BWG, feed intake, adjusted FCR, NE lesion scores, and microbial load of feed were evaluated by ANOVA (the MIXED procedure in SAS (SAS Institute, Cary NC; v9.4). Means were further separated using Tukey's HSD.

Table 1. Treatment Groups

Treatment	NE Challenge	Feed Treatment	Termin-8 Inclusion Rate Starter (d0-17)	Termin-8 Inclusion Rate Grower (d17-28)	Termin-8 Inclusion Rate Finisher (d28-35)	n ¹
1	Yes	Termin-8	6 lbs/ton	-	-	264
2	Yes	Termin-8	6 lbs/ton	4 lbs/ton	4 lbs/ton	264
3	Yes	Termin-8	-	6 lbs/ton	4 lbs/ton	264
4	No	Untreated	-	-	-	264
5	Yes	Untreated	-	-	-	264

¹288 chicks/treatment were placed on DOH. On d7, birds were counted and adjusted to 22 birds per pen (n=264/treatment)

Results and Discussion

In the current study, feed sanitation using Termin-8 significantly ($P \leq 0.00014$) increased broiler performance while reducing NE related mortality and lesions under NE challenge conditions when compared to the untreated, challenge control. While the treatment was most impactful during the challenge period, all treatments fed a sanitized diet exhibited increased performance during the study.

Table 2. Effect of a Feed Sanitizer on Average NE Lesion Scores

	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	SEM	P-value
AVG NE Lesion Score	2.15 ^a	1.55 ^b	1.82 ^b	0.00 ^a	3.70 ^c	0.239	0.0014

^{a,b,c} Indicates significant differences between treatments by row ($P<0.05$)

Figure 1. Effects of a Feed Sanitizer on Broiler Performance

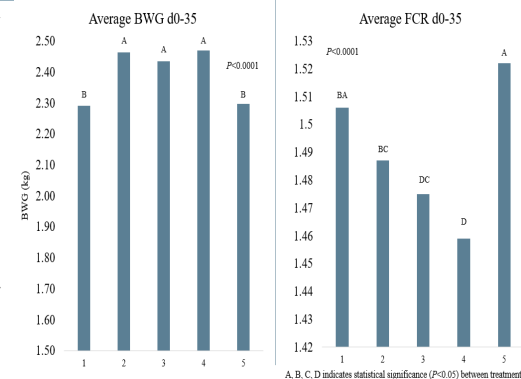
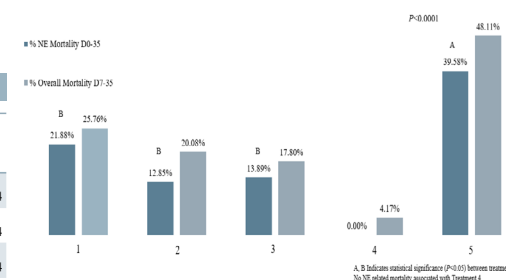


Figure 2. Effect of a Feed Sanitizer on NE related Mortality



Conclusions

Feeding a Termin-8 sanitized diet in the starter feed only or through grower and finisher phase reduced NE lesion scoring, mortality, and oocyst shedding, while also increasing performance when compared to the NE challenged, non-treated control group. From these data, it could be hypothesized that by decreasing loads of bacteria entering the gastrointestinal tract via feed, the intestinal distress of the broiler chicken is reduced, thus, improving NE control.

References

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