



Evaluation of a Proprietary Blend of Natural, Intestinal Health Ingredients to Reduce the Effects of Necrotic Enteritis in Broilers Raised on Litter¹

Abstract

This floor pen study was conducted to evaluate the efficacy of a proprietary Kemin antibiotic alternative gut health product that contains tannic acid extract (TAE), *Bacillus subtilis*, PB6 (PB6), plant extracts and algae beta glucans (together, C4 Blend) to reduce the negative effects of necrotic enteritis (NE) challenge on broiler performance and mortality. Male Cobb 500 broiler chicks (n = 3,000) were vaccinated on day (d) of hatch with COCCIVAC®-B52 and then randomly assigned to one of three treatments (15 reps; 50 birds/pen): 1) Not challenged control, 2) Challenged control and 3) Challenged, fed C4 Blend (0.5 lb./ton). Birds in the challenged control and C4 Blend groups were challenged with *Clostridium perfringens* (1.0E8 CFU/mL) in feed daily on d19, 20 and 21 to induce NE. On d21, NE lesion scores were measured from three birds/pen, and performance was measured on d0, 28 and 42. Total mortality and mortality due to NE were assessed during the entire trial period. Compared to the challenged control, C4 Blend had significantly lower lesion scores (P<0.05). BWG did not differ between the challenged control and C4 Blend at d28 (P>0.05), but at d42, C4 Blend had significantly higher BWG compared to the challenged control (P<0.05). At d28 and d42, C4 Blend had significantly lower FCR when compared to challenged control (P<0.05). The C4 Blend was able to effectively minimize the negative effects of the NE challenge on broiler performance.

Introduction

Necrotic enteritis (NE) and coccidiosis are common concurrent enteric infections which can negatively impact broiler health and performance. Losses in animal performance due to these diseases cost the global poultry industry more than two billion USD annually.² Increased incidence of these diseases, especially NE, have been associated with the rapid growth of antibiotic-free (ABF) and no antibiotic ever (NAE) poultry production programs, which are estimated to compose 45–50 percent of commercial poultry flocks in the United States.³⁻⁶ Commercial poultry producers now face the daunting challenge to maintain broiler health and performance without antibiotics which have traditionally been used to control enteric bacterial challenges like NE and coccidiosis.

Use of alternative gut health-promoting dietary interventions is one of many methods that can be used to reduce disease risks posed by commercial production of ABF poultry. Gut health feed additives have diverse modes of action, from balancing intestinal microflora to enhancing intestinal integrity and supporting immune function.

Most producers believe that combination strategies, such as using multiple antibiotic alternative products in feed, are likely to be the most effective methods for controlling concurrent enteric diseases like coccidiosis and NE in broilers.⁷ Kemin has recently pursued a strategy to develop a proprietary blend of gut health ingredients (Tannic acid extract, *Bacillus subtilis*, PB6, plant extracts (oregano essential oil and *yucca schidigera* extract) and algae beta glucans (together, C4 Blend)) to help producers manage costly enteric challenges, like NE and coccidiosis, in the absence of antibiotic interventions. In prior battery cage studies, C4 Blend was observed to improve performance of broilers challenged with NE by dual infection of *Eimeria maxima* and *C. perfringens*.⁸ Over 28 days, C4 Blend provided similar benefits in performance to those of an antibiotic in NE challenged broilers, indicating that the C4 Blend is a potential effective alternative product for reducing the effects of NE in broilers.⁹

The aim of the present study was to evaluate the effectiveness of C4 Blend to reduce the effects of NE on performance and mortality of broilers raised on litter to 42 days of age.

Materials and Methods

Day old Cobb 500 male broiler chicks were randomly assigned to one of three treatments (15 reps/trt; 50 birds/pen): 1) No challenge, not treated control (No CP), 2) Challenged, not treated control (CP) and 3) Challenged, treated with C4 Blend (0.5 lb./ton). All birds were vaccinated with a 1X dose of COCCIVAC®-B52 then allowed to preen. In addition to vaccination, broilers in Treatment 2 and 3 were challenged with *Clostridium perfringens* on d19, 20 and 21. A commercial field isolate of *C. perfringens* known to induce NE was utilized as the challenge organism. Fresh *C. perfringens* inoculum was provided to the birds each day. Birds were raised for 42d.

A non-medicated (no antibiotic and no anti-coccidiostat), corn-soybean-based, pelleted diet was used for this trial. Diets were fed in three phases: starter (d0-21), grower (d21-28) and finisher (d28-42). Food and water were provided ad libitum.

Birds and feed were weighed by pen at d0, 28 and 42. Means for pen weight gain (0-28 and 0-42), feed intake (FI), and mortality adjusted feed conversion ratio (FCR) were then calculated.

On d21, three birds from each pen (15 reps/treatment) were selected to determine the presence of necrotic enteritis lesions. The intestinal duodenum was scored using the NE lesion scoring system which was based on a 0 to 3 score, with 0 being no lesions, 1 being mild lesions, 2 being moderate lesions and 3 being severe lesions.

Results and Discussion

Average NE lesion scores and mortality due to NE are shown in Table 1. Compared to the challenged control group, C4 Blend had significantly lower average lesion scores ($P<0.05$). No differences were observed in NE mortality between the challenged control group and C4 Blend ($P<0.05$).

Table 1. Average necrotic enteritis (NE) lesion scores and NE mortality of broilers.

Treatments ^{1,4}	Lesion Score	Average Mortality (%)
No CP ²	0.00 ^c	0.00 ^a
CP ³	1.09 ^a	1.33 ^b
C4 Blend ³	0.50 ^b	0.53 ^{ab}
SEM ⁵	0.05	0.30
P-value	<0.001	0.012

^{a-c}Values in the same column with different superscript letters indicate differences in means ($P<0.05$). ¹Treatments were replicated in 15 pens (n=15), with 3 birds lesion scored per pen. ²Birds were not challenged with *C. perfringens* (CP). ³Birds were challenged with CP on d19, 20, and 21. ⁴No CP = not treated, not challenged; CP = not treated, challenged; C4 Blend = Kemin proprietary blend (0.5 lb/ton). ⁵Standard Error of the Mean.

No differences were seen in body weight gain (BWG) at d28 between the challenged control group and C4 Blend ($P>0.05$; Figure 1A). At d 42, C4 Blend had significantly higher BWG when compared to the challenged control group ($P<0.05$; Figure 1B).

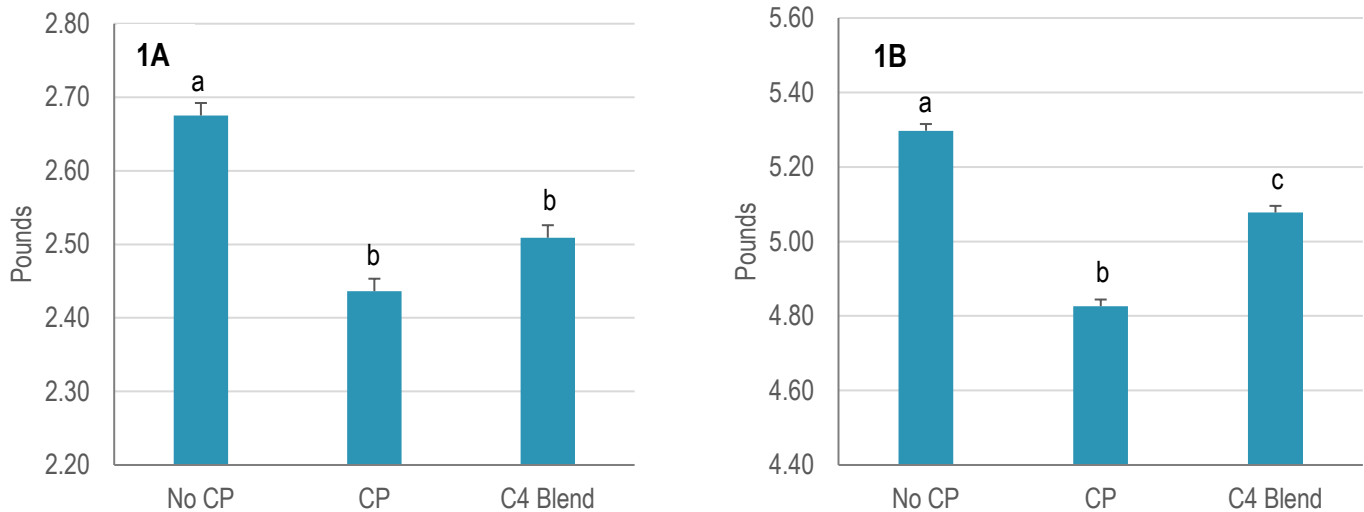


Figure 1. Body Weight Gain (BWG) at d0-28 (1A) and d0-42 (1B) in broilers challenged with *Clostridium perfringens* (CP) and supplemented with C4 Blend. Error bars represent SEM. ^{a-c}Differing superscripts indicate significant difference at P<0.05. Treatments: No CP = not treated, not challenged; CP = not treated, challenged; C4 Blend = Challenged + Kemin proprietary blend (0.5 lb./ton).

At d28 and d42, C4 Blend had significantly lower FCR adjusted to mortality when compared to challenged control (P<0.05; Figure 2).

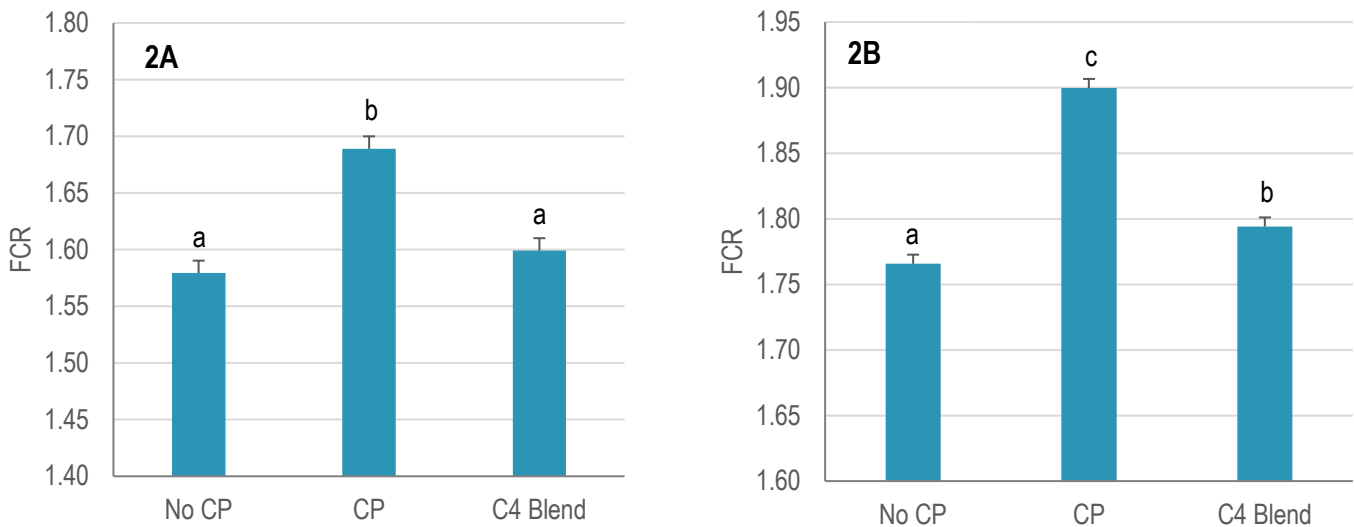


Figure 2. Morality adjusted Feed Conversion Ratio (FCR) at d0-28 (2A) and d0-42 (2B) in broilers challenged with *Clostridium perfringens* (CP) and supplemented with C4 Blend. Error bars represent SEM. ^{a-c}Differing superscripts indicate significant difference at P<0.05. Treatments: No CP = not treated, not challenged; CP = not treated, challenged; C4 Blend = Challenged + Kemin proprietary blend (0.5 lb./ton).

Conclusion

The results of the study indicate that the C4 Blend was able to reduce the negative effects of NE challenge on performance of broilers raised on litter to 42 days.

References

1. Evaluation of VANNIX™ C4 to reduce the effects of necrotic enteritis in broilers raised on litter, 19-5106.
2. Lee KW, Lillehoj HS, Jeong W, Jeoung HY, and An DJ. (2011). Avian necrotic enteritis: Experimental models, host immunity, pathogenesis, risk factors, and vaccine development. *Poultry Science*, 90:1381-1390.
3. Dahiya JP, Wilkie DC, Van Kessel AG, and Drew MD. (2006). Potential strategies for controlling necrotic enteritis in broiler chickens in post-antibiotic era. *Animal Feed Science and Technology*, 129:60-88.
4. Timbermont L, Haesebrouck F, Ducatelle R, and Van Immerseel F. (2011). Necrotic enteritis in broilers: an updated review on the pathogenesis. *Avian Pathology*, 40:341-347.
5. Alanzo A. (2018). 4 key factors to reduce necrotic enteritis in broilers. WATT Poultry USA.
6. Roembke J. (2018). Marketing-drive poultry production's real feed costs. WATT Poultry USA.
7. Williams RB. (2005). Intercurrent coccidiosis and necrotic enteritis of chickens: rational, integrated disease management by maintenance of gut integrity. *Avian Pathology*, 34:159-180.
8. Development of a proprietary antibiotic alternative VANNIX™ C4 for mitigation of necrotic enteritis in broilers – part I, 18-00130.
9. Development of a proprietary antibiotic alternative VANNIX™ C4 for mitigation of necrotic enteritis in broilers – part II, 18-00066.

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