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The Effect of a Water Soluble Active Microbial On Broiler Performance[1]

Introduction

Necrotic enteritis (NE) is a significant issue in the poultry industry globally costing over $2 million in losses annually.[2] These losses are accrued through decreased weight gain and increased mortality rates. NE is most prevalent during the winter months with outbreaks attributed to enclosed environments due to cold weather conditions. NE has traditionally been controlled with the use of bacitracin methylene disalicylate (BMD®, Zoetis, Madison, New Jersey). However, the U.S. poultry market continues to shift from conventional practices to raising birds without antibiotics. This means BMD is no longer an option for controlling NE, and the industry has been left searching for effective antibiotic replacement solutions. *Bacillus subtilis* PB6 (PB6) is an active microbial and has been shown to exhibit antimicrobial activity against *Clostridium perfringens*, the causative agent of NE, when delivered through the feed.

In order to increase the customer's flexibility of PB6 delivery, a water soluble product was developed to co-exist with CLOSTAT Dry for feed. CLOSTAT® WS is delivered through the water via a medicator and does not require any diet formulation changes. This increases the ability to target houses with historic NE breaks. A study was conducted to evaluate the effect of PB6 when delivered in a water soluble (WS) form at different concentrations on the performance and health parameters in broilers in a necrotic enteritis challenge model.

Materials & Methods

On day of hatch, Cobb x Cobb 500 chicks were randomly assigned to 5 treatment groups (Table 1; 12 reps/treatment; 8 birds/cage) for the 28 d trial. Inclusion levels of WS were calculated to deliver PB6 at either 2.0E+06 (WS-T) or 5.0E+05 CFU/mL (WS-P) of drinking water. Established in prior research, WS-T was determined to be a therapeutic level of spores while WS-P was determined to be a preventative level of spores. In this study, a chemical coccidiostat, salinomycin, was used as a positive control. An unmedicated, commercial starter ration was formulated with feedstuffs commonly used in the United States. All feed was fed as pellets. The diets and water were provided ad libitum throughout the experiment period (0-28 d).

All test birds, except Treatment 1, were inoculated with 5,000 oocysts of *Eimeria maxima* on d14 of the trial. On d19, 20, and 21 all birds, except Treatment 1, were orally inoculated with E8 CFU/mL *Clostridium perfringens.* This isolate is a field strain known to cause necrotic enteritis (NE) and originates from a southeastern United States commercial broiler operation.

On d21, three birds/cage were examined for the presence of NE lesions. The intestine was scored using the NE lesion scoring system, 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. Weight gain (WG), feed intake, feed conversion ratio (FCR), and mortality due to necrotic enteritis were the response variables evaluated throughout the 28 d study.

Table 1. Treatments used for the necrotic enteritis challenge trial.

Treatment No.	Treatment Name	Treatment Type	*Clostridium* Challenge
1	Negative Control	No treatment	Not Challenged
2	Positive Control	No treatment	Challenged
3	Salinomycin	Salinomycin (60 g/ton)	Challenged
4	CWS-T	*Bacillus* PB6 (E6 CFU/ml)	Challenged
5	CWS-P	*Bacillus* PB6 (E5 CFU/ml)	Challenged

Key: WS-T = Water Soluble – therapeutic; WS-P = Water Soluble-preventative

Results and Discussion

The WS-P treatment delivers the same PB6 spore count as CLOSTAT Dry (level in the feed); however when birds break with NE, feed intake decrease and water consumption increases. Thus, to take advantage of the higher water intake an increased spore count treatment (WS-T) was included. Over the entire trial period (d0-28), WS-P was equal to salinomycin in FCR and WG but not different from WS-T (Table 2). Both salinomycin and PB6 significantly reduced lesion scores and mortality due to necrotic enteritis compared to positive control (infected/not treated) group but were not different from each other (Table 2).

Table 2. Effect of *Bacillus subtilis* PB6 on feed conversion ratio (FCR), weight gain (WG), lesions, and mortality due to necrotic enteritis.

Treatments	FCR	WG (kg)	Lesions	Mortality (%)
Negative Control	1.904^{c}	0.506^{ab}	0.00^{d}	0.0^{b}
Positive Control	2.293^{a}	0.420^{b}	1.68^{a}	10.4^{a}
Salinomycin	1.902^{c}	0.525^{a}	0.65^{c}	1.0^{b}
WS-T	2.101^{b}	0.433^{b}	0.81^{bc}	2.1^{b}
WS-P	1.996^{bc}	0.468^{ab}	0.64^{c}	2.1^{b}

Key: WS-T = Water Soluble – therapeutic; WS-P = Water Soluble-preventative. Negative control = not infected/not treated; Positive control = infected/not treated. Different letters within a column are significant at $P < 0.05$.

In a prior paired house study, WS-T improved livability by 2% over the untreated control when WS-T was provided 7 days prior to historical NE breaks in the house.[3]

Conclusion

The results of this study indicate *Bacillus subtilis* PB6 was effective in addressing the negative effects of necrotic enteritis. *Bacillus subtilis* PB6 was not as effective as salinomycin but a good alternative for systems unable to use salinomycin.

References

1. Kemin Internal Document, 17-00093.
2. W. Van der Sluis. Clostridial enteritis is an often underestimated problem. World Poult, 16 (2000), pp. 42-43.
3. Kemin Internal Document, 16-00026.