

Technical Bulletin

Information from Phibro Technical Services

Trial Demonstrates Non-Interference and Possible Synergistic Effect of Direct-Fed Microbial and Live Salmonella Vaccine

Provia Prime™ direct-fed microbial offers a patent-pending combination of four *Bacillus* strains that provide a synergistic effect to improve broiler intestinal health. Studies have demonstrated birds fed Provia Prime show improved health, performance and yield. These strains have superb heat stability, a long shelf life and do not require refrigeration. Also, Provia Prime has excellent gut viability with a high survivability against gastric acid and bile salts.

This trial demonstrated

- No interference was observed in broilers fed Provia Prime at two different levels when vaccinated with a live Salmonella vaccine
- A group fed Provia Prime at 530,000 CFU/g and vaccinated with a live Salmonella vaccine had reduced levels of *Salmonella kentucky* in the ceca at day 42 (after challenge at four days of age)
- Broilers fed Provia Prime had a significant improvement in feed conversion which was further enhanced when a live Salmonella vaccine was included

Trial Design

Commercial broilers were raised in pens of 50 birds, including 10 pens for each of four treatment groups. The treatment groups included an untreated control, a group fed Provia Prime at 530,000 CFU/g, a group fed Provia Prime at 530,000 CFU/g and vaccinated with a commercial Salmonella vaccine on day of age, and a group fed Provia Prime at 1,000,000 CFU/g and vaccinated with a commercial Salmonella vaccine on day of age. Two days after vaccination, four birds each from the third and fourth groups were cultured for the presence of Salmonella to confirm proper vaccination.

On day four of the trial, 25 birds in each pen were orally administered a *Salmonella kentucky* strain using oral

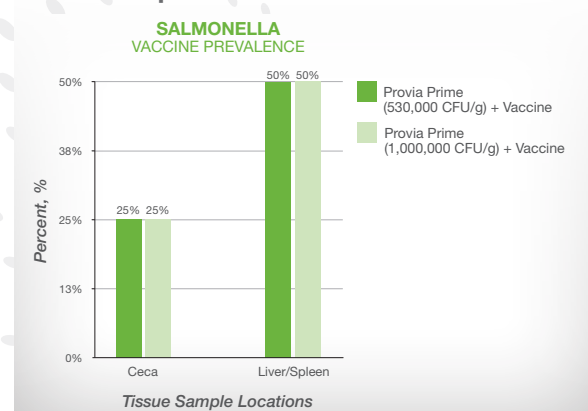
gavage with the intention of infecting the remaining birds in the pen to simulate horizontal infection as it commonly occurs in the field.

The trial was conducted on new, clean litter and all birds were vaccinated for coccidiosis. Birds were fed standard starter, grower and finisher rations. After a feed withdrawal at the end of the trial, 15 horizontally infected birds in half of the pens of each treatment were tested for Salmonella by culture of the ceca.

Results

Two days after vaccination, four birds were collected from different pens of the two treatment groups that included both Provia Prime and the live Salmonella vaccine to confirm there was no interference between the products. Samples were evaluated from the ceca and a combination of tissue from the liver and spleen. All identified Salmonella isolates were typed as serogroup B, the vaccine serogroup, and presumed to be the vaccine strain. The serogroup B Salmonella presence of 25% in the ceca and 50% in the liver and spleen tissue combination are consistent with results of other studies with this vaccine (Figure 1).

Figure 1: Identified Presence of Salmonella in Ceca and Liver/Spleen Tissues

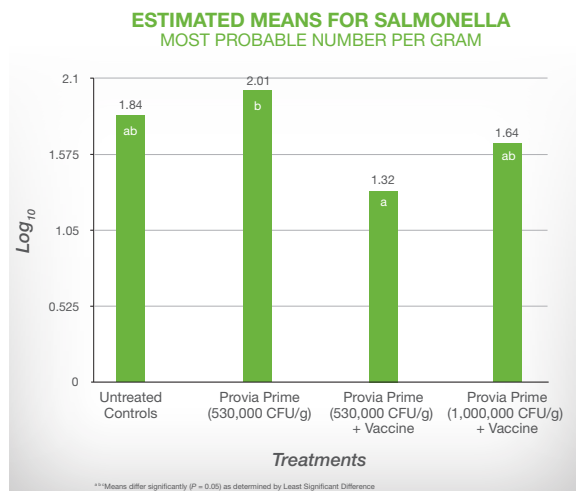


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Litter in all pens was confirmed *Salmonella kentucky* positive by Day 14 and again on Day 42 using a boot sock sample technique (data not shown). Also, ceca samples were evaluated from 150 horizontally infected birds from each treatment group and there was no statistically significant difference in *Salmonella kentucky* prevalence (range of 95.3-100%, data not shown). These results confirm horizontal infection from seeder birds to unchallenged birds, again closely mirroring natural infection in a production setting.

Some ceca samples were negative in the culture test. It is not possible to confirm if the samples were free of Salmonella or if the Salmonella concentration was below the limits of detection of the test. A Tobit regression statistical model was applied to the results which estimates a true mean of Salmonella numbers based on distribution of most probable numbers in the positive samples, as well as proportions of negative samples in the different treatment groups. Use of this model allows a comparison of the effects of the treatment groups on the most probable number of *Salmonella kentucky* per gram in collected ceca (Figure 2).

Figure 2: Most Probable Number of *Salmonella kentucky* per gram of Collected Ceca

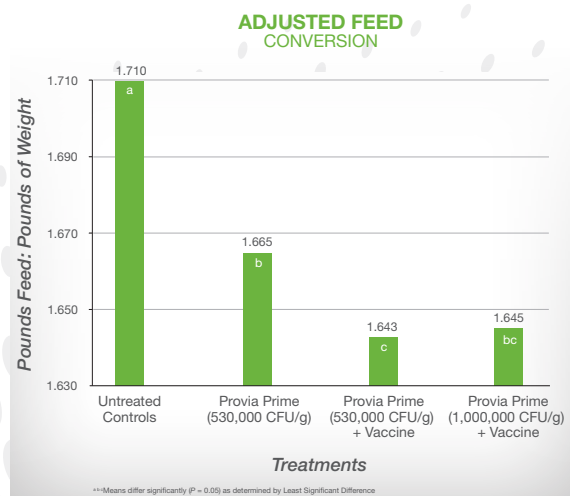


The treatment using the lower level of Provia Prime and vaccine group had a statistically significant reduction in the estimated means of the most probable numbers in this trial. Likewise, the higher level of Provia Prime and vaccine group showed a numerical reduction.

These results suggest the possibility of Provia Prime working synergistically with the vaccine in reducing *Salmonella kentucky* counts prior to processing.

All birds fed Provia Prime had a statistically significant improvement in feed conversion (Figure 3). Numerical improvements were noted in both groups using a combination of Provia Prime and vaccine, with the lower level of Provia Prime and vaccine showing a statistically significant difference from other groups. Considering this trial was conducted using new, clean litter on concrete floors, these results demonstrate the impact of feeding Provia Prime on broiler performance.

Figure 3: Statistically Significant Improvements in Feed Conversion Ratio



Conclusion

Salmonella kentucky is the most common serovar implicated in failure to meet Food Safety and Inspection Service performance standards. Producers are seeking interventions to help reduce the load of *Salmonella kentucky* entering the processing plant.

In this controlled exposure trial, the use of Provia Prime with a live *Salmonella* vaccine appears to have reduced the amount of *Salmonella kentucky* in the ceca at the end of the trial. With no concern of product interference, the combination of Provia Prime and live *Salmonella* vaccine offers producers a solid foundation to use in building a program to reduce the impact of *Salmonella kentucky* in broiler operations. As an added benefit, all Provia Prime groups demonstrated improved feed conversion which has been repeatedly shown in both clinical trials and field use.