MERCK ANIMAL HEALTH
TECHNICAL SERVICES BULLETIN

Comparison Study using Innovax®-ND-IBD: Protection Against Three Common Variant IBDV Strains in US – 9109, AL-2 and Del E

INTRODUCTION

Innovax®-ND-IBD, the first dual-construct rHVT vaccine, offers protection against Newcastle disease (ND), infectious bursal disease (IBD) and Marek's disease after hatchery vaccination without vaccination reaction or damage to the bursa[1]. In the US, most challenges from IBDV in broilers are associated with variant IBDV strains and usually occur in the first three weeks of commercial broiler's life. Birds infected with variant IBDV don't have IBD clinical signs, but they have subclinical immunosuppression with performance loss due to increased secondary infection, rolling vaccine reaction, and processing plant condemnation. Previous studies conducted in the US have demonstrated protection from Innovax®-ND-IBD as early as 18 days of age (DOA) with variant 9109 and AL-2 challenges in Specific Pathogen Free (SPF) birds[2], and as early as 14 DOA with Delaware variant E (Del E) IBDV challenge in commercial broiler chicks, even if vaccinated with high IBDV maternal antibodies present[3].

This study, conducted at the University of Georgia in the US, investigated protection from Innovax®-ND-IBD or a competitor rHVT-ND-IBD vaccine against three different variant IBDV strains at the early age of 14 days.

SPF leghorn chickens were vaccinated subcutaneously with a full commercial dose of Innovax®-ND-IBD or a full commercial dose of competitor rHVT-ND-IBD vaccine according to the manufacturer's directions at one DOA. Protection was evaluated following different variant IBDV challenges at 14 DOA based on bursal score, bursa/body weight (Bu/BW) ratio, bursa weight, and body weight.

KEY POINTS

- In this study, Innovax®-ND-IBD showed significantly lower bursal score by histopathology examination compared to the competitor rHVT-ND-IBD vaccine 7 days after 9109 and AL-2 challenge, while bursal score after Del E challenge was similar.
- Innovax®-ND-IBD was significantly higher in bursa/body weight ratio for two variant strains and similar for the other strain compared to competitor rHVT-ND-IBD product when challenged at 14 DOA.
- After AL-2 challenge at 14 DOA, competitor rHVT-ND-IBD met minimum protection level defined in this study and was significantly lower in body weight compared to unvaccinated challenge control group.
- After challenge with the three different variant IBDV isolates at 14 DOA, Innovax®-ND-IBD exhibited better performance compared to competitor rHVT-ND-IBD vaccine, based on higher bursa and body weight 7 days post-challenge presented in Figures 3 & 4.

STUDY DESIGN

Four-hundred SPF chicks were divided into groups and vaccinated subcutaneously with a full dose of Innovax®-ND-IBD, a full dose of competitor rHVT-ND-IBD vaccine or were not vaccinated at 1 DOA.

Individual groups of birds were challenged with one of three different variant IBDV field strains: 9109, AL-2 or Del E at 14 DOA ($10^{3.0}$ EID_{50}/ bird) via eye-drop inoculation. Bursal score, Bu/BW ratio, bursa weight, and body weight were evaluated 7 days post-challenge. Bursa score was evaluated via histopathology examination according to a scoring system based on scores of 1 (normal to 10% bursa follicular atrophy), 2 (10-30% bursa follicular atrophy), 3 (30-70% bursa follicular atrophy), and 4 (more than 70% bursa follicular atrophy). Protection against challenge was determined by a Bu/BW ratio greater than or equal to the Bu/BW ratio of the unvaccinated challenge group plus two unvaccinated challenge group standard deviations (the dotted red lines in Figure 2).

RESULTS

Statistics were performed using One-way ANOVA with uncorrected Fisher's LSD (Graphpad Prism, v8). Different letters above the bars in the graph denote groups with significant differences at $p<0.05$.

BURSAL SCORES

The variant IBD challenge from each strain was severe, resulting in a bursal histopathology score of 4. Innovax®-ND-IBD showed significantly better bursal score (better protection against 14-day challenge) compared to the competitor rHVT-ND-IBD vaccine after 9109 and AL-2 challenge, while bursal score after Del E challenge was similar (see Figure 1).

BURSAL: BODY WEIGHT RATIO

Innovax®-ND-IBD showed significantly or better bursa/body weight ratio compared to competitor rHVT-ND-IBD product for AL-2 and Del E challenge

Figure 1: Average bursal scores following challenge at 14 days of age. Different letters above bars in graph denote groups with significant differences at p<0.05.

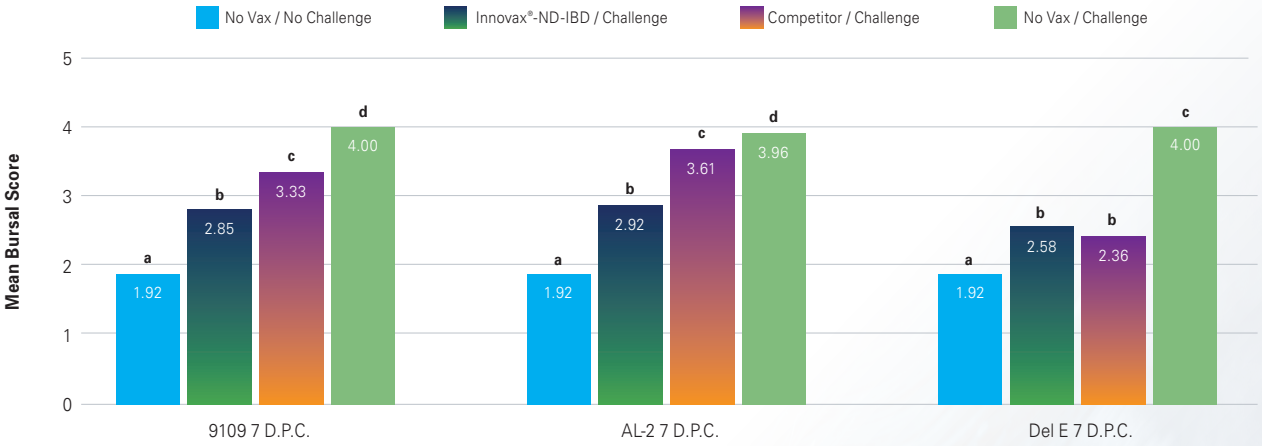
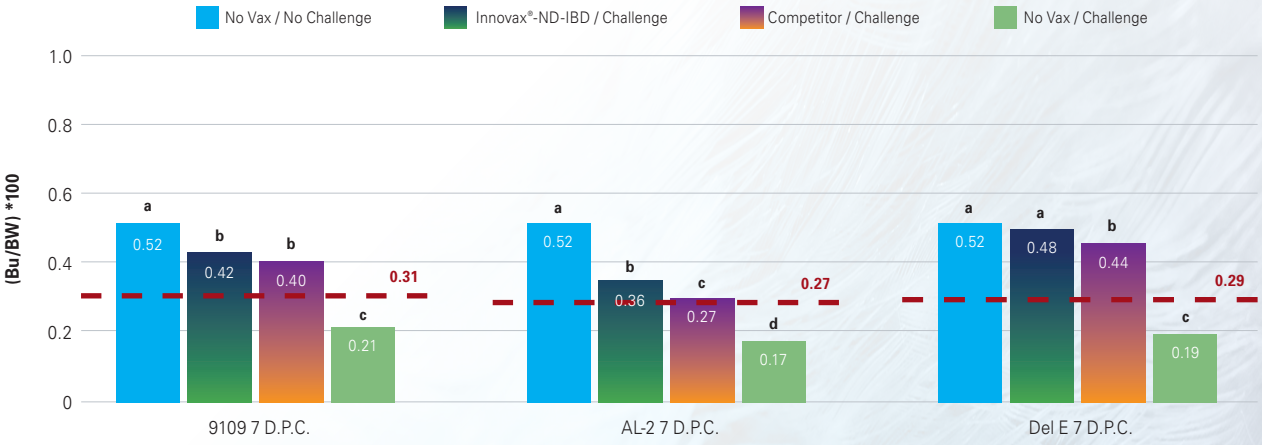


Figure 2: Bursa/Bodyweight ratio following challenge at 14 days of age. Protection against challenge determined by Bu/BW ratios greater or equal to Bu/BW ratio of the Unvaccinated/positive challenge control group plus 2 standard deviations. Represented by the dotted line in each individual bar graph. Different letters above bars in graph denote groups with significant differences at p<0.05.



with similar results for 9109 challenge at 14 DOA. Competitor vaccine met minimum protection levels for this study (see Figure 2).

AVERAGE BODY WEIGHT

Innovax®-ND-IBD showed higher body weight compared to the competitor rHVT-ND-IBD product when challenged at 14 DOA with all three different variant IBDV strains. The effect of IBD challenge on bird weight was evident even in SPF birds. The protection was reflected in better weights in the Innovax®-ND-IBD vaccinated birds. Specifically, after AL-2 challenge, birds vaccinated with the competitor rHVT-ND-IBD had lower body weight compared to unvaccinated/challenge group (see Figure 3).

AVERAGE BURSA WEIGHT

Lower bursa weight reflected higher challenge from different variant isolated and less protection resulted in more severe bursal atrophy. Innovax®-ND-IBD showed significantly higher or similar bursa weight compared to the competitor rHVT-ND-IBD product when challenged at 14 DOA with all three different variant IBDV strains (see Figure 4).

Figure 3: Average bodyweight 7 days post-challenge at 21 DOA. Different letters above bars in graph denote groups with significant differences at p<0.05.

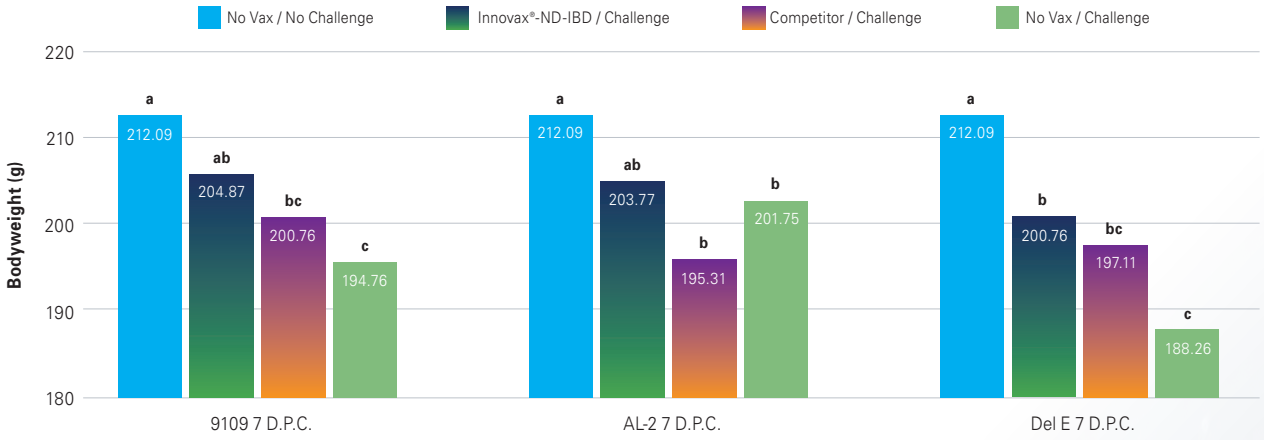
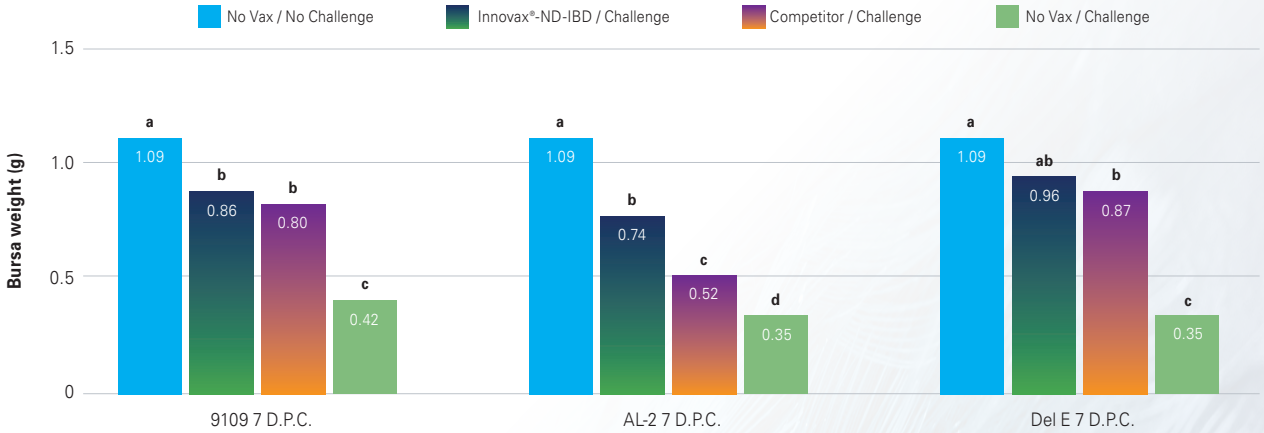


Figure 4: Average bursa weight 7 days post-challenge at 21 DOA. Different letters above bars in graph denote groups with significant differences at p<0.05.



CONCLUSION

Overall, Innovax®-ND-IBD provided better protection and better performance at 14 DOA against 9109, AL-2, or Del E variant IBDV isolates compared to competitor rHVT-ND-IBD vaccine in this study.

References:
1. Data on file, Merck Animal Health.
2. Andres Montoya, WVPA 2019, Bangkok, Thailand.
3. Ivan Alvarado, WVPA 2019, Bangkok, Thailand

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