Case study

Antibody response after vaccination of broiler chickens with VAXXITEK® HVT+IBD under field conditions

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Abstract

A field study examining seroconversion following vaccination with VAXXITEK HVT+IBD was conducted in Brazil in a large integrated broiler operation. Broiler flocks were monitored for VAXXITEK HVT+IBD uptake, field infectious bursal disease virus (IBDV) and chicken anemia virus (CAV) exposure via antibody response and virus detection. The aim of the study was to examine the effects of concurrent CAV exposure, if CAV exposure affects the antibody response to vaccine or alter the protection against IBDV. Early seroconversion was detected in all flocks to IBDV in response to vaccination. CAV antibodies were detected between 30-34 days & 37-41 days of age. Serology and histology demonstrated IBDV infection after 30 days of age for molecular groups 3 and 15 IBDVs. In this study, CAV infection did not impact seroconversion to vaccination.

Introduction

Immunosuppression is a constant battle in commercial poultry flocks. Many factors in the rearing environment, not limited to viruses and bacteria, can alter the birds immune response to pathogens and the vaccines we administer to improve health. Two viral agents are particularly notable for their immunosuppressive abilities, IBDV and CAV. Both viruses can create a lymphocytolytic infection that is capable of suppressing both humoral and cell-mediated immune functions [1]. To examine the potential effects of these two immunosuppressive agents in Brazilian broilers, a field study was conducted to determine if CAV exposure was affecting antibody response and protection to a recombinant IBDV vaccine administered in ovo. In addition, the study allowed better characterization of the antibody response after vaccination with VAXXITEK HVT+IBD in field conditions.

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Materials & methods

Twelve broiler flocks in the region of the South tip of Brazil were monitored for VAXXITEK HVT+IBD uptake, field IBDV exposure (antibody response and virus detection) and CAV exposure (antibody response and virus detection). Hatching eggs were vaccinated at embryo day 18-19 with VAXXITEK HVT+IBD, except for one flock out of the 12 that was injected subcutaneously at day 1. Samples were collected for virology and serology testing as outlined in Figure 1.

Serology

Vaccine uptake was evaluated serologically using an anti-VP2 increased affinity ELISA (ProFLOK® IBD, Zoetis Inc., Kansas City, MO, USA). Antibody response to field IBDV and CAV infections were assessed with a classic IBDV ELISA (ProFLOK IBD Plus, Zoetis Inc., Kansas City, MO, USA) and an anti-CAV ELISA (ProFLOK CAV Ab ELISA, Zoetis Inc., Kansas City, MO, USA) respectively.

Virology

Samples from the bursa of Fabricius (BF) and feathers were tested by different molecular methodologies locally in Brazil to detect the viruses of interest, IBDV and CAV. For CAV a portion of the gene encoding the capsid protein was amplified. To detect the vaccine strain in VAXXITEK HVT+IBD, a 438 base pair fragment within the hypervariable region of expressed VP2 protein was detected. For field strains of IBDV, a fragment of the hypervariable region of VP2 was detected by either PCR for direct characterization of IBDV molecular group, or a nested PCR with further characterization of positive samples. If PCR samples were unsuccessful, optional virus isolation was performed by injection of BF or spleen extracts into embryonated eggs followed by monitoring of lesions.

Histopathology

Histopathology was conducted on BF samples to examine IBDV lesions and provide bursal scoring at a private diagnostic laboratory in Brazil.

Results / Discussion

Serologically, high protective titers (GMT > 8,660) were detected starting at 25-27 days of age in most of the flocks (Figure 2). Using PCR, VAXXITEK IBDV molecular group 9 detected in all flocks at this time point, validating the presence of DNA sequence of the Faragher VP2 insert specific to the vector vaccine. In general, no classic ELISA anti-IBDV maternal antibodies were detected (Figure 3). IBDV molecular group 15 (most prevalent type in Brazilian commercial flocks) was detected by PCR in 10 out of 12 flocks.

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IBDV molecular group 3 was detected by PCR in one flock and no field IBDV was detected in two flocks (Figure 4). Histopathological examination of the Bursa yielded a BF score >2 in 6 out of 12 flocks (max BF lesion score: 4). The IBDV vaccination program using VAXXITEK HVT+IBD produced a serological response correlated with protection (>4000GMT) by 25-27 days in all but one flock. Early seroconversion validates the in ovo vaccination and provides early protection to field IBDV. 100% of feathers sampled were positive for VAXXITEK HVT+IBD VP2 (molecular group 9). Despite good seroconversion and vaccine detection, serology and histology demonstrated field IBDV infection after 30 days of age, most notably viruses grouping in molecular group 15.

No anti-CAV maternal Abs detected using CAV ELISA. Moderate antibody titers against CAV were detected starting at 30-34 days (Figure 5). Using PCR methods, CAV was detected in 11 out of the 12 flocks, and detected early in 6 flocks (Figure 6). No maternal antibodies to CAV were detected, indicating a lack of seroconversion in breeder flocks. Maternal antibodies are critical to prevent the early and severe aplastic anemia that can occur with vertically transmitted CAV infections [1]. CAV seroconversion occurred in tested flocks between 30-34 days or 37-41 days, correlating well with a field infection of CAV. 68% of broilers were CAV infected after the second week of age. PCR detection in flocks starting at 25-27 days confirms the timing of field infection and lateral transmission in the flocks.

**Conclusion**

In this field study, CAV exposure did not affect the antibody response to VAXXITEK HVT+IBD vaccine. Additional studies would need to be performed to conclude if the horizontally transmitted CAV that was evident serologically played a role in observed in vivo replication of the molecular groups 3 and 15 IBDVs.

**References**

**Figure 1:** Sampling timeline.

ED = embryo day; BF = bursa of Fabricius.

**Figure 2:** Anti-VP2 serology, vaccine uptake.

Abs = antibodies; GMT = geometric mean titer.
**Figure 3:** Anti-VP3 serology, antibody response to field IBDV.

Abs = antibodies; GMT = geometric mean titer.

**Figure 4:** Percentage of positive birds for field IBDV by PCR (different colors indicate different molecular groups).
Figure 5: Anti-CAV serology, antibody response to field CAV.

Anti-CAV Abs

Abs = antibodies; GMT = geometric mean titer.

Figure 6: Percentage of sampled birds PCR positive for CAV.