COMPARISON OF THE SAFETY AND IMMUNOGENICITY OF DIFFERENT IBD VACCINE TECHNOLOGIES IN BROILER CHICKENS

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INTRODUCTION

The presence of maternally derived antibodies (MDA) is of great importance in the immunogenicity of infectious bursal disease (IBD) live-attenuated vaccines, since the level of these will determine the time of the virus replication. The onset of immunity of technological IBD vaccines applied at hatchery level is also known to be affected by MDA presence although in different ways. GUMBOHATCH® is a next-generation immune complex vaccine against IBD virus (IBDV) with a different formulation (IgY of egg origin) and control parameters to ensure the complete coating of the vaccine virus and the maintenance of maximum potency, even in the presence of high levels of MDA. The aim of this trial was to evaluate the safety and the immune response produced by GUMBOHATCH® in comparison to different IBD vaccine technologies when administered in commercial broiler chickens with a high MDA levels.

MATERIALS & METHODS

240 one-day old chickens with MDA against IBDV (7808±xxx ELISA units at hatch, IBD IDEXX kit) were randomly allocated into 4 groups (G) of n=40. G1 was vaccinated subcutaneously with GUMBOHATCH® (next-generation IBD immune complex vaccine), G2 with a recombinant HVT+IBD vaccine, G3 with a live genotype 3 IBD vaccine and G4 with PBS (control group) at 1 day of age. Additionally, all the animals were vaccinated against infectious bronchitis virus, Marek and Newcastle diseases. Clinical signs and mortality were recorded throughout the study. Chickens were periodically humanely killed to evaluate the lesions at the bursa of Fabricius. Specifically, the bursa and the body weight were recorded, macroscopic lesions were evaluated, and samples were fixed in 10% neutral buffered formalin to examine the microscopic lesions. Cloacal swabs were collected from 5 animals per group between 18 and 25 days of life to monitor the excretion of IBDV. Bursal samples were collected to identify the presence and identity of IBDV. The lymphocyte depletion in bursal samples was scored in accordance with the European pharmacopoeia. Blood samples were collected periodically from the birds to evaluate the antibody immune response against IBDV by ELISA (ID Screen® IBD VP2). Percentages of T and B cells in the bursa of Fabricius were evaluated at 21, 25, 28 and 35 days of life by flow cytometry analysis. Bursa to body weight ratios (BB) and antibody titres were analysed and compared between groups using an ANOVA test. Antibody titres were previously Log2 transformed. Histopathological lesion scores of bursas were compared between groups using a One-Way ANOVA and Kruskal-Wallis test. Differences between groups were considered to be significant at $p<0.05$.

RESULTS & DISCUSSION

Vaccination produced an antibody response against IBD in groups G1, G2 and G3 with similar levels and coverage; despite this, the response was detected earlier in G1 and G2 compared with G3.

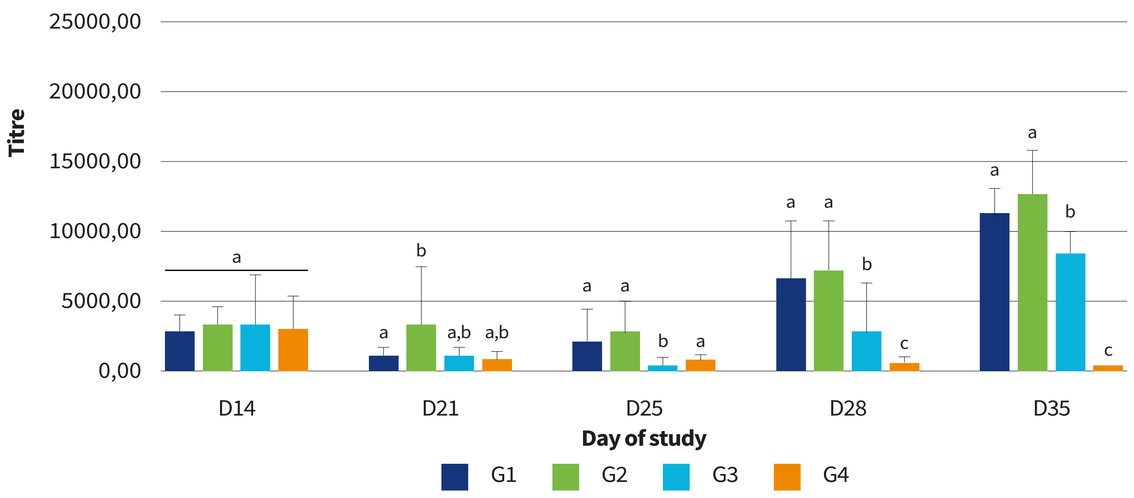

Fig. 1. Antibody response against IBDV in sera (ID Screen® IBD VP2). Results are represented as average with standard deviation. Different letters indicate a statistically significant difference (ANOVA test; $p<0.05$).

G1 and G3 showed similar levels of an expected bursal atrophy (bursa to body weight ratio) although the onset of this effect was observed at 25 days in the first group and at 28 in the second group, showing an earlier replication of the vaccine strain in G1.

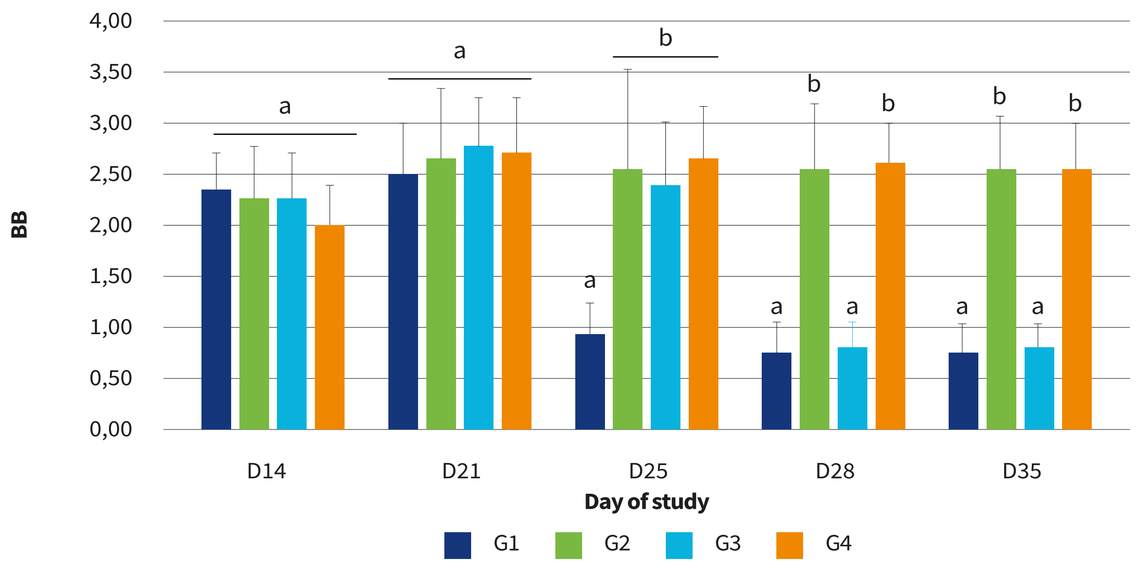

Figure 2. Bursa to Body weight index (BB). Results are represented as average and standard deviation. Different letters indicate a statistically significant difference (One-Way ANOVA test with Tukey or Games-Howell post hoc, $p<0.05$).

Lymphocyte depletion was observed in the bursas of the groups receiving a live vaccine (G1: 4.50±0.85 and G3: 5±0 lesions score) although no statistically significant differences in levels were detected between them (Kruskal-Wallis test; $p<0.05$). No atrophy or lymphocyte depletion was observed in the bursas of G2, as expected for recombinant vaccines.

Flow cytometry analysis showed a transitory reduction in the proportion of bursal B cells (depletion) from 25 to 28 days post-vaccination in G1 and G3, and consequently an increase in the proportion of T and also non-T-non-B cells was observed. Although a reduction in the proportion of B cells in the bursa similarly occurred in both groups, it seemed to be higher in G1 at day 25, indicating that replication could occur earlier with this vaccine. Notably, G2 did not show any change in the studied bursal cell populations.

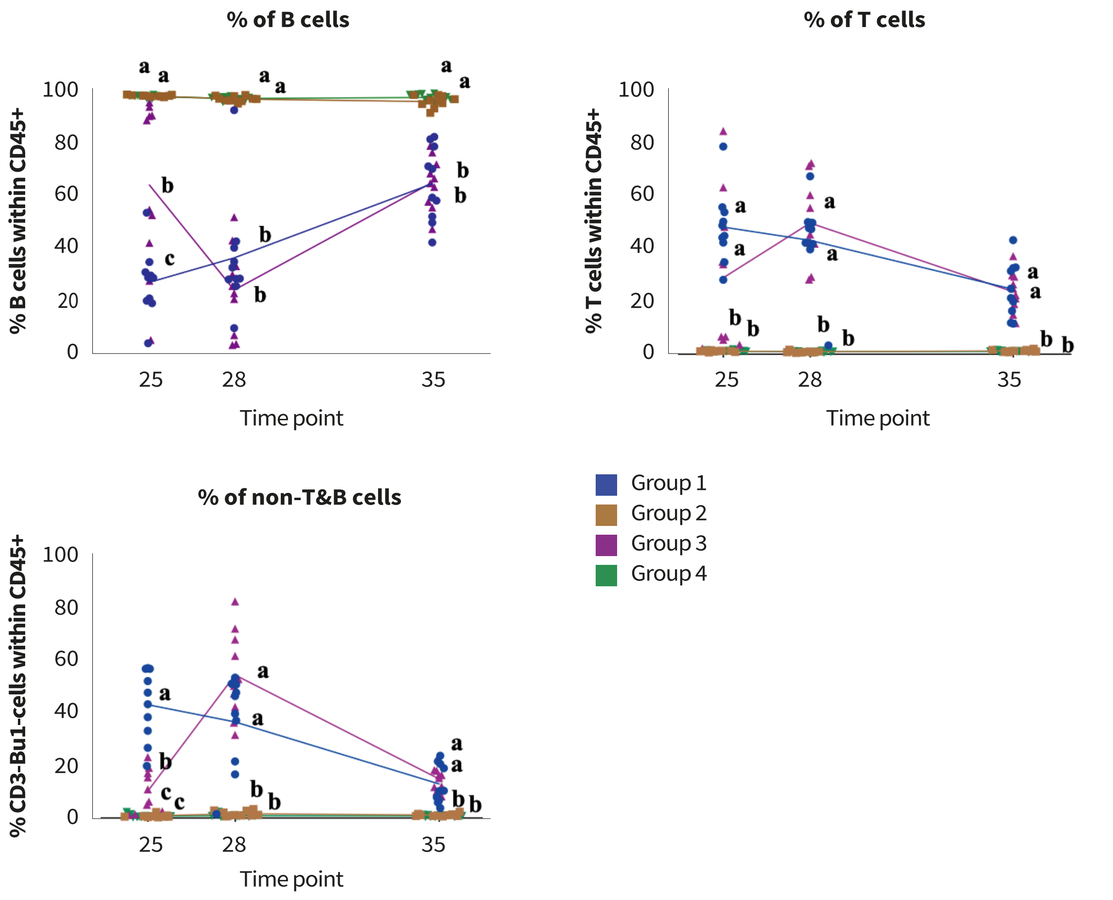

Fig. 3. Percentage of B and T and non-T/B cells in the Bursa of Fabricius at days 25, 28 and 35 days. Each dot represents a different animal. The line represents the average. Different letters indicate a statistically significant difference (Kruskal-Wallis test; $p<0.05$).

IBDV was detected by PCR in the cloacal swabs of groups G1 and G3 but not G2; in accordance with previous results, the first positive animals started to be detected earlier in G1 than G3, at 19 and 24 days respectively. These data again confirmed an earlier replication of the vaccine in the bursa.

In terms of body weight, no statistically significant differences were observed between groups during most of the study, thus vaccination did not compromise the body growth of birds in any of the groups. These ended up with an average weight ranging between 2.088 and 2.162 Kg (One way ANOVA with Tukey post hoc, not statistically different, $p>0.05$)

CONCLUSIONS

In conclusion, GUMBOHATCH® was shown to be the vaccine that provided the earliest replication, and therefore immunization, in chickens with high IBDV MDA, compared to the other commercial live vaccines involved in this trial. In addition, no differences were observed in the final body weight of the birds vaccinated with GUMBOHATCH® compared to birds vaccinated with an HVT-IBD vaccine. Therefore, this study suggests that GUMBOHATCH® is a safe and reliable solution for the immunization of birds against IBDV on farms with early risk of disease.

REFERENCES

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