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FG comparative study between antigen-antibody complex vaccine and traditional vaccine of infectious bursal disease in commercial broiler

Mohammed Lateef Abdulhadi
Office of Veterinary, Ministry of Agriculture

Dr- Nawal S. Jaafer
College of Veterinary Medicine, University of Baghdad

***Abstract*---**Infectious bursal disease (IBD) is a viral disease causes increased mortality and severe immunosuppressionin commercial chickens. The virus infects the bursa of Fabricius of particularly the actively dividing and differentiating lymphocytes of the B-cellslineage of young chickens, resultant in morbidity, mortality, and immunosuppression. Immunosuppression enhances the susceptibility of chickens to other infections and interferes with vaccination against other diseases. Immunization is the most important measure to control IBD; however, wild usage of live vaccines has resulted in the evolution of new strains. Although the immunosuppression caused by IBDV is more directed toward the B lymphocytes, the protective immunity in birds depends on inducement of both humeral and cell-mediated immune responses. Currently vaccination mainly used to control IBD. In this study, Group 1(n = 50) received the immune complex vaccine (Bursa-Plex®) s/c at 1 day of age. Group 2 (n = 50) received the GUMBORO (D78)(intervet)vaccine by drinking water and Group 3 (n = 50) were non IBD vaccinated birds. The aim of study: Evaluation between two types of IBD vaccines, immune-complex IBD vaccine (Bursaplex®) with the use of GUMBORO D78(intervet) vaccine. Depending on:At 7,14,21, 28th day P.V. • Serology (IBD ELISA (INFY)- cellular immunity).

***Keywords*---**complex vaccine, traditional vaccine, infectious bursal disease, commercial broiler.

Introduction

IBDV termed as avian nephrosis or "classic IBDV" was first reported from Gumboro in Delaware, USA in the year 1962 and hence the name of the disease was originated besides "IBD" or "infectious bursitis." The disease has spread to most parts of the USA between 1960 and 1964, and affected Europe in between 1962 and 1971, (Dey *et al.*, 2019). Cosgrove 1962 reported a specific disease, (IBD) that affecting the bursa of Fabricius in chickens. The first cases were seen in area of Gumboro, United States of America (USA), which is the name derived. In the year of 1960 and 1964, the disease observed in most part of the USA, with its pandemic movement from the year 1966 to 1974, the disease was reported in the southern and western Africa, Far East, Middle East, India and Australia (Wagari, 2021). There are two serotypes of IBDV (serotypes 1 and 2). Strains of serotype 1 IBDV are pathogenic only in chickens, and are further classified as classical virulent IBDV, very virulent IBDV, antigenic variant IBDV and attenuated IBDV (Bolis *et al.*, 2003). Only chickens develop IBD after infection by serotype 1 viruses. Serotype 2 viruses are immunologically distinct from serotype 1 viruses since vaccination with serotype 2 viruses did not confer protection against serotype 1, (Delmas *etal.*, 2004).

Immunosuppression

The level of activation varies depending on the virulence of infecting strains, age, immune status and genetic background of affected chickens. The immune response can be altered by maternal antibody and the more virulent vaccine strains can override higher levels of antibodies. Progeny of parent flocks vaccinated with classical strains of IBD virus may have poor maternal immunity against strains of the virus (Ignjatovic *et al.*, 2001). Immunosuppression decreases the resistance of birds to other infections and also leads to an inadequate immune response to vaccination (Orakpoghenor *et al.*, 2020).

IBDV immune complex vaccines

Immune complex vaccine (Icx) is a cocktail of live pathogenic IBDV strains mixed with anti-IBDV antibodies derived from hyperimmunized chickens sera or recombinant neutralizing antibody and is available commercially (Whitfill *et al.*, 1995; Ignjatovic *et al.*, 2006). Icx vaccines are also used to vaccinate in ovo at day 18 of incubation using automated technology to achieve very precise vaccination. By this route of inoculation, the vaccine induces the formation of more germinal centers in the spleen, thus resulting in localization of IBDV in dendritic and bursal follicles. Post challenge, IBDV-Icx vaccine efficacy was found to be equal to or better than that of conventional live vaccines. (Jeurissen *et al.*, 1998).These vaccines consist of a mixture of a certain amount of IBDV-specific antibodies obtained from the sera of hyperimmunized chickens and infectious IBD vaccine virus (Whitfill *et al.*, 1995). Their major advantage is that they are suitable for in ovo vaccination at day 18 of incubation with commercial egg-injection machines, the Icx vaccines can be delivered by subcutaneous injection at 1 day old in the hatchery (Ivan *etal.*, 2005).

Material and methods

Location and period of experiment

The experiment was carried out in the animal house /department of pathology/ College of Veterinary Medicine / Baghdad University/Iraq. The laboratory analyses were carried out at the scientific source laboratory of scientific progress of biotechnology and molecular genetics analysis for the period from 19/12/2021 to 23/1/2022. Unvaccinated 1day old ROSS- 308 broiler chicks (Total number 210), obtained from a commercial hatchery. The chicks were maintained in isolation units (in separate pens). All birds were provided with feed and water ad libitum. Birds were maintained following standard management practices.

Blood sampling

Blood samples were collected in sterile tubes and left to clot in a sloping position at 37 °C for one hour. This was followed by overnight refrigeration, followed by centrifugation at 3000 rpm for 15 min to separate the sera and stored at −20 °C until use. Serological titration of IBD-antibodies was performed using commercial indirect classical ELISA kits (Chicken Interferon γ, IFN-γ). According to the manufacturer's instructions, IBD immune status was considered negative if ELISA titer is less than 875.

Chicken Interferon γ, IFN-γ ELISA Kit

This ELISA kit uses Sandwich-ELISA as the method. The Microelisastrip plate provided in this kit has been pre-coated with an antibody specific to IFN-γ. Standards or samples are added to the appropriate Microelisastrip plate wells and combined to the specific antibody. Then a Horseradish Peroxidase (HRP)-conjugated antibody specific for IFN-γ is added to each Microelisastrip plate well and incubated. Free components are washed away. The TMB substrate solution is added to each well. Only those wells that contain IFN-γ and HRP conjugated IFN-γ antibody will appear blue in color and then turn yellow after the addition of the stop solution. The optical density (OD) is measured spectrophotometrically at a wavelength of 450 nm. The OD value is proportional to the concentration of IFN-γ. You can calculate the concentration of IFN-γ in the samples by comparing the OD of the samples to the standard curve.

Statistical analysis

The Statistical Analysis System- SAS (2012) program was used to detect the effect of difference factors in study parameters. Least significant difference –LSD test (Analysis of Variation-ANOVA) was used to significant compare between means in this study.

Results and Discussion

Serum samples collected from chicken at (7, 14, 21, 28) day old were examined by using ELISA test. The result serological response to IBDV vaccines was illustrated in Table (1). The result showed in week 1 that the antibody titer concentration in

G1 (vaccinated group with Ag-Ab complex (Bursaplex)®-) was (29.53 ±1.61) and in G2 was (39.82 ±3.07) which vaccinated with (D78) vaccine,while in G3 (control group) was (32.81 ±3.82) that showed there are significant difference (P≤0.05) between the groups. In week 2 there is no significant difference between the groups. In week 3 the antibody titer concentration in G1 was (35.05 ±4.13) while in G2 (45.44 ±4.35) and the antibody titer concentration was decline (16.62 ±0.62) in G3 that showed significant difference (P≤0.05) between the groups. In week 4 the antibody titer concentration was elevation in G1 (52.01 ±3.50) while the antibody titer was decline in G2, G3 (26.88 ±4.87)(10.75 ±1.43)respectively and there is a significant difference (P≤0.05) between the groups till the end of experiment.

Table 1: Comparison between difference groups in Interferon

Group	Mean ± SE of Interferon			
	Week 1	Week 2	Week 3	Week 4
G1	29.53 ±1.61 b	22.01 ±2.52	35.05 ±4.13 a	52.01 ±3.50 a
G2	39.82 ±3.07a	19.25 ±1.90	45.44 ±4.35 a	26.88 ±4.87 b
G3	32.81 ±3.82 ab	23.36 ±2.36	16.62 ±0.62 b	10.75 ±1.43 c
LSD value	9.58 *	8.09 NS	10.64 *	10.78 *
Means having with the different letters in same column differed significantly. * (P≤0.05).				

This result revealed that all the used live IBDV vaccines were non immunosuppressive and were able to induce antibody levels in chickens with maternal IBDV antibodies in the absence of IBDV. Such result confirmed the findings of Marquardt et al., (1980); Briggs *etal.*, (1986); Solano *et al.*, (1986) ; Van den Berg and Meulemans, (1991). Also, this result was in accord with this reported by Abdel-Alim and Kawkab (2006) who found that live intermediate plus IBDV vaccines were immunogenic with better immune response in eye drop vaccinated groups. Moreover, there were no differences between the vaccinated groups in the measured parameters (Naqi *et al.*, 1980).

Conclusion

It was evident from the results that immune complex antigen was an equally better option to enhance the antibody titer against infectious bursal disease and improve the protection in birds. Therefore, the immune complex antigen may also be promoted as an equally best vaccine candidate to protect poultry birds against infectious bursal disease virus.

Recommendations

Chickens should be vaccinated against most infectious disease including IBD. Management factors like, scheduled vaccine program in backyard, proper biosecurity in semi intensive and intensive farm should be implemented to reduce the magnitude of IBDV infection in investigation area.

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