

COMPARATIVE IMMUNOGENICITY OF BIOTYPHOID® AND DLS PREPARED FOWL TYPHOID VACCINE IN LAYER CHICKENS

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ABSTRACT

The experiment was conducted to investigate the immunogenicity of DLS prepared Fowl typhoid vaccine in comparison to commercially available BIO-TYPHOID® (Imported by Advance Animal Science Co. Ltd., Bangladesh) in layer chickens. To compare the immunogenicity of these two vaccines a total of 30 chickens were divided into three groups (group A, B and C) each including 10 layer chickens of Fayoumi breed. Chickens of group A and B were vaccinated with DLS prepared fowl typhoid vaccine and BIO-TYPHOID® respectively following usual schedule of vaccination (i.e. first dose at 42 days of age and second dose at 72 and 112 days for DLS prepared fowl typhoid vaccine and BIO-TYPHOID® respectively) with a dose of 0.5 ml at each occasion through SC route. Birds of group C were kept as unvaccinated control. Blood samples were collected to obtain sera from each chicken at every 7 days interval up to 105 days post vaccination for determination of antibody titre following primary and secondary vaccination using Microplate Agglutination test. Highest mean antibody titres obtained from Group A and B which were 460.80 and 409.60 respectively. Among the chickens vaccinated the highest mean antibody titre of 460.80 was obtained at 56 days post vaccination from chickens in group A vaccinated with DLS prepared Fowl typhoid vaccine. Results of this study revealed that DLS prepared fowl typhoid vaccine induced higher antibody production than BIO-TYPHOID®.

Key words: Comparative, immunogenicity, DLS, fowl typhoid, vaccine, BIO-TYPHOID®

INTRODUCTION

Fowl typhoid remains a serious systemic disease of domestic poultry which may cause large scale economic losses through mortality, morbidity and reduction in egg production. The disease is under control in many countries in Europe and North America but remains a major problem in countries where poultry husbandry was recently intensified or where the high ambient temperature causes difficulties to environmental hygiene. Even in countries where the disease is controlled, vigilance remains important. FT is a major problem in poultry industry of the world as well as in Bangladesh. With great expansion of the poultry rearing and farming, fowl typhoid has become wide spread problem in Bangladesh like other area of the world (Sarker, 1976 and Rahman *et. al.*, 1979). The basis for the successful control of *Salmonella* infections in poultry farms is good farming and hygiene practices and the testing and removal of positive flocks from production (Calnek *et. al.*, 1997). Vaccination of chickens is regarded as an additional measure to increase the resistance of birds against *Salmonella* exposure and decrease shedding of *Salmonella*. Vaccination against *S. gallinarum* is commonly used as preventive measure. In Bangladesh both live and killed FT vaccines are available, which are imported and marketed by commercial companies. Moreover, DLS is also engaged in manufacturing a killed FT vaccine to control poultry Salmonellosis in Bangladesh. Before introducing any biologics or vaccines within a country it must be monitored for its immunogenicity by the respective controlling agency. Unfortunately, in developing countries like Bangladesh sometimes it would not be possible to perform such type of works. Hence, the present work was designed to study the immunogenicity of DLS prepared FT vaccine in comparison to a commercially available FT vaccine.

MATERIALS AND METHODS

The study was carried out in the Bacteriology laboratory of the Department of Microbiology and Hygiene, Bangladesh Agricultural University (BAU), Mymensingh during the period from January to June, 2008.

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Experimental chickens

A total of 30 day-old chicks of Fayoumi breed were collected from the poultry farm of Bangladesh Agricultural University (BAU), Mymensingh. These chicks were reared in the poultry shed of the Department of Microbiology and Hygiene, Bangladesh Agricultural University (BAU), Mymensingh providing commercial feed and water with proper biosecurity.

Collection of vaccine

Two inactivated fowl typhoid (FT) vaccines were used in this experiment. These are- a) Fowl typhoid vaccine produced by the Department of Livestock Services (DLS) at the Livestock Research Institute (LRI), Mohakhali, Dhaka was obtained from the District Livestock Office, Mymensingh and b) Bio-Typhoid[®] produced by Merial, France, and marketed by Advance Animal Science Co. Ltd. was purchased from the local market. These vaccines were stored at 4-8^oC until use.

Salmonella gallinarum isolate

A local isolate of *S. gallinarum* was obtained from the laboratory repository of the Department of Microbiology and Hygiene, BAU, Mymensingh and was maintained as stock to use as antigen in the agglutination test.

Experimental immunization

A total of 30 day old chicks were used in this experiment and the birds were divided into 3 groups viz. A, B and C each group containing 10 chicks. The birds of group A and B were vaccinated with DLS prepared FT vaccine and BIO-TYPHOID[®] following usual schedule of vaccination. In case of group A, 1st dose of DLS prepared FT vaccine was administered at 42 days of age of the birds, then 2nd dose was administered at 72 days of age. In case of group B, 1st dose of "BIO-TYPHOID[®]" was administered at 42 days of age of the birds, then 2nd dose was administered at 112 days of age. The immunization was conducted following the procedure of Heddleston and Reisinger (1960). The birds of group C were kept unvaccinated. The vaccines were administered through SC route @ 0.5 ml per bird.

Collection of sera from the immunized birds

About 1.5- 2 ml of blood samples were collected aseptically without anticoagulant from the jugular vein or wing vein at 7 days interval up to 105 days post vaccination and serum was prepared following procedure mentioned by Heddleston and Reisinger (1960). The serum samples were inactivated following procedure described by Choudhury *et al.* 1985 and stored at - 20^oC until use.

Microplate Agglutination Test

The Microplate Agglutination test was carried out with the sera to determine the presence of specific antibody against *S. gallinarum* and titre of antibody in the sera. The test was conducted following the procedure of Schlink and Olson (1979). The value reciprocal to the highest dilution at which agglutination occurred was considered as the titre of the serum. The antibody titre was expressed as Geometric mean with standard error.

RESULTS AND DISCUSSION

In Bangladesh only DLS produces FT vaccine only and small number of commercial companies import FT vaccine for marketing. Among the imported FT vaccines, BIO-TYPHOID[®] is widely used one.

The pre-vaccination antibody titre of sera samples of all experimental birds were found with a mean of $< 4 \pm 0.00$.

The primary vaccination first induced rise of antibody titres which ranged from 16 to 128 in both groups (A and B). In group A the lowest post primary vaccination titres which ranged from 16 to 32 was obtained after 7 days and highest post primary vaccination titre which ranged from 64 to 128 was obtained at day 21 and maintained up to before administration of secondary vaccination after 30 days of primary vaccination. In group B the lowest post primary vaccination titres which ranged from 16 to 32 was obtained at day 7 and highest post primary vaccination titres which ranged from 64 to 128 was obtained at day 21 and maintained up to day 56, then started to decline before secondary vaccination and reach to a level of 32 to 64 at day 70 of primary vaccination. Similar findings also observed by Bhattacharya *et al.* (2004). The authors observed that the antibody titre induced by primary vaccination first reached to a peak, which declined gradually thereafter.

Comparative immunogenicity of biotyphoid[®] and DLS prepared fowl typhoid vaccine

In both vaccination groups, secondary vaccination further induced rise of antibody titre. In group A lowest antibody titre induced by secondary vaccination ranged from 64 to 128 obtained at 35 days post primary vaccination (i.e. 5 days after second vaccination) and highest post secondary vaccination titre which ranged from 256 to 512 was obtained at day 49 (i.e. 19 days after second vaccination) and maintained up to day 70 (i.e. 40 days after second vaccination), then started to decline and reach to a level of 128 to 256 at day 105 post vaccination (i.e. 75 days after second vaccination). In group B the lowest antibody titre induced by secondary vaccination ranged from 64 to 128 was obtained at day 77 post primary vaccination (i.e. 7 days after secondary vaccination) and highest post secondary vaccination titre which ranged from 256 to 512 was obtained at day 91 (i.e. 21 days post secondary vaccination) and maintained up to day 105 post primary vaccination (i.e. 35 days post secondary vaccination) (Table 1).

Table 1. Comparative results of post vaccination antibody titres in Mean±SE of chickens in group A and B (vaccinated respectively with DLS prepared Fowl typhoid vaccine and BIO-TYPHOID[®] following usual schedule of vaccination)

Pre-vaccination antibody titre of all birds (vaccinated + unvaccinated) (Mean±SE)	Post-vaccination antibody titre									
	Group A				Group B					
	Vaccine used	Age of vaccination		Days post primary vaccination	Antibody titre (Mean±SE)	Vaccine used	Age of vaccination		Days post primary vaccination	Antibody titre (Mean±SE)
		1 st dose	2 nd dose				1 st dose	2 nd dose		
≤4±0				7	24.00±2.67				7	20.80±2.44
≤4±0				14	44.80±5.23				14	38.40±4.27
≤4±0				21	108.80±9.8				21	83.20±9.78
≤4±0				28	102.40±10.45				28	96.00±10.67
≤4±0				35	115.20±8.53				35	89.60±10.45
≤4±0				42	204.80±20.90				42	83.20±9.78
≤4±0	DLS-FTV	42 days	72 days	49	409.60±41.80	BIO-TYPHOID [®]	42 days	112 days	49	80.00±10.93
≤4±0				56	460.80±34.13				56	76.80±8.53
≤4±0				63	435.20±39.10				63	70.40±6.40
≤4±0				70	332.80±39.10				70	51.20±5.23
≤4±0				77	230.40±17.07				77	108.80±9.78
≤4±0				84	204.80±20.90				84	204.80±20.90
≤4±0				91	179.20±20.90				91	409.60±41.80
≤4±0				98	166.40±19.55				98	384.00±42.67
≤4±0				105	153.60±17.07				105	332.80±39.10

Legends

SE = Standard error of Mean

≤ = Less than or equal to

DLS-FTV = DLS prepared fowl typhoid vaccine

It was observed that, the level of antibody induced by DLS-FT vaccine, which was administered in the birds of group A with the 1st dose at 42 days (6weeks) and 2nd dose at 72 days (10 weeks) respectively was higher than the antibody level induced by BIO-TYPHOID[®], administered in the birds of group B with the 1st dose at 42 days (6weeks) and 2nd dose at 112 days (16 weeks) of age respectively. However BIO-TYPHOID[®] produced lower level of antibody but induced a long lasting immune response. Similar findings were also reported by Lee (2007). The author found that immune response induced by a vaccine which was administered as 1st dose at the age of 6 weeks and 2nd dose at 18 weeks was persistent throughout the duration of the study from 21 weeks old to 61 weeks old.

So, from the above study, it was observed that chickens of group A vaccinated with DLS prepared Fowl typhoid vaccine exhibited higher antibody titre than the chickens in group B vaccinated with BIO-TYPHOID[®]. The stimulation of higher level of immunity by DLS-FT vaccine might be due to higher immunogenic character of the vaccine strain and use of local isolate of *S. gallinarum* in DLS-FT vaccine.

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