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Effect of Different Plans of Nutrition on Immune Response Against Newcastle Disease in Cross (FAY x RIR) Chicken

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Abstract: Immunization against New Castle disease can be more effective by giving balanced nutrition and coordinated disease control programme. The present study is designed to determine the resistance level of HI (Haemagglutination inhibition) titre that is immune response of birds vaccinated against Newcastle disease in cross chicken (FAY x RIR) fed at different plans of nutrition. For this purpose different recipes/rations A,B,C and D was prepared and offered to chicken. Immunity level against ND was checked for about 30 days post vaccination. It was observed that there was a significantly ($P < 0.05$) higher G.M.T at 10 and 20 days post vaccination with respect to day of vaccination and reading taken at 30 days post vaccination. This trend was observed in all the groups fed on different experimental rations. The highest G.M.T was observed in Group A while minimum G. M. T was noticed in group D. The statistical analysis revealed that G.M.T of chicken belonging to group A, B and C was significantly ($P < 0.05$) higher than group D. This response indicated that composition of ration had significant influence on antibody titre subsequent to vaccination of chicks.

Key words: Newcastle disease, haemagglutination inhibition, crude protein, fayoumi rhode island red

Introduction

The interaction between nutrition and immune system has been of great concern to animal nutritionists for many years. Since the immune system is critical for maintenance of health. The physiological changes that accompany an immune response can be referred as "immunological stress" (Klasing *et al.*, 1991). This stress response is typified by poor growth rates, impaired feed conversion and altered nutrient requirement.

It is readily accepted that growth rate slows during most clinically identifiable infections and it is often presumed that this growth depression is mediated by immune system. Chicks housed in germ free environment grow 15% faster than those raised in conventional environment and chicks housed in clean disinfected quarters grow faster and more efficiently than those in less sanitary condition (Klasing *et al.*, 1991).

The literature on vaccination provides direct evidence for growth depression consequence of an immune response. There are various mechanisms by which immune system can mediate growth and nutrition related metabolism. There is a direct neural connection between immune tissue such as thymus, spleen and lymph nodes and central nervous system. Consequently the immune system can invoke the metabolism changes through hormones normally under pituitary control.

Several responses are particularly important from growth and nutrient requirement respiratory, excretory, reproductive and nervous etc. are mainly dependent upon nutrition as well as other management and environmental factors.

Newcastle disease is considered a highly fatal and most serious viral disease in Pakistan affecting commercial as well as rural poultry (Anjum, 1997). At present rural poultry is contributing almost 30 % in overall poultry production. It is facing threatening challenges of Newcastle disease and some time's whole flocks' sweep away resulting in heavy loss to the poor village farmers. The field reports suggest improvement in flocks nutrition to avoid acute spread and heavy mortality in flocks.

The present project was therefore designed to study the effect of different plans of nutrition on immune response in rural chicken.

Materials and Methods

The study was conducted at Poultry Research Institute, Rawalpindi on 247 (FAY x RIR) cross chicken, which included 32 male and 215 females having age 48 weeks. All the birds were divided into four groups A, B, C and D. Each group was further subdivided into three replicates and each replicate was composed of almost equal number of females and males.

Four different experimental rations A, B, C and D were prepared at Nutrition Section, Poultry Research Institute, Rawalpindi, on basis of different feasible plan of feeding (Table 1). The birds were placed in respective experimental plans. Requisite amount of feed was offered at the rate of 120 gm per bird per day. Fresh water was available for 24 hours. While a total of 17 hrs light was provided to all birds.

The immune response against Newcastle disease belonging to each replicate was estimated from eggs through HI (Haemagglutination inhibition) titre estimation (Allan *et al.*, 1978) prior to vaccination. The birds were vaccinated against Newcastle disease and subsequent immune response was studied through HI titre estimation after very 10 days post vaccination for a period of 30 days.

Haemagglutination inhibition test

Washing of Chicken Red Blood Curpuscles (RBS's): Five ml blood was collected from an adult bird in a test tube Containing Alserver's sol as an anticoagulant. It was centrifugated at 3000 rpm (Resolution per minute) for 3 minute. The supernatant plasma was discarded and packed RBCs were resuspended to original volume of phosphate buffer saline. The process of RBCs resuspension in phosphate buffer. Saline and centrifugation was repeated three times. Washed RBCs were resuspended in measurable volume of phosphate buffer saline to get 0.5 % RBCs suspension. For example for making 10ml of RBC and 9.8 ml of PBS (Phosphate Buffer Saline) were added.

Determination of Haemagglutination: About 50 ul of PBS was added in each well of HI plate by micro dispenser.

In first well 50 ul of test virus was added in above HI plate and then with the help of titre tech hand multi diluter this was serially diluted from each well by passing 50 ml, thus diluting each well as 1:2, 1:4, 1:8, 1:16, ...1:4096.

In all wells 0.5 % chicken RBCs were added. Agitated plate and placed in the incubator for 30 min or left at room temperature for 30 minutes. The highest dilution causing Haemagglutination was taken as one HA unit which result after dividing unit dilution of virus by 10 so 10 HA unit was prepared.

Procedure for HI test: Diluted antigen in HI buffer to contain 10-haemagglutinating unit (HA) in 50 μl.

- In all wells except the first deposited 50μl of antigen. In first well deposited 100 μl of antigen.
- Using a 25-μl micro titre diluter deposited 25μl of yolk in first well. Diluted serially by passing 50 μl from each well using a micro titre transfer diluter.

- Incubated at 37°C in incubator for 5 minute or at root temp for 20-30 minute. Added 50μl of chicken red blood (0.5%CRBC) to all wells. Agitated plate gently and let stand for 45 minute at room temp or incubated for 30 min at 27°C.
- Read the plate and determined HI titre. The end point was the well of highest dilution where a clear button was seen.
- A RBC's control was run by adding 50 μl of PBS and 50 μl of 0.5 % RBC's to a well. This well should be buttoned.

The results of HI titre of all eggs thus obtained were recorded and subjected to statistical analysis to calculate the geometric mean titre (Burgh, 1978). This geometric mean titre (GMT) was subjected to statistical analysis by analysis of variance technique (Steel and Torrie, 1981).

Results and Discussion

The immune response of cross (FAY x PIR) chicken, which were fed different experimental rations A, B, C and D was observed. For this purpose HI G.M.T was calculated at 0, 10, 20 and 30 days of vaccination against Newcastle disease (Table 1). The minimum G.M.T (17.5) was observed in group A at the day of vaccination while the maximum G.M.T was also recorded in same group at 10 days of vaccination.

The results indicated that there was a sharp increase in G.M.T of chicken belonging to all the groups under response of vaccination against Newcastle disease. This titre then gradually decreased at 20 days and 30 days of vaccination. These results were contrary to findings of Villegas *et al*. (1983), who observed elevation in HI antibody titre from live vaccine at 3 weeks of age. The difference could be attributed to a different behavior of rural chicken or environmental stress because the observation was taken in hot season during the month of May and June. The average G.M.TA of all the groups had 0 to 30 days post vaccination also indicated that the antibody titre against Newcastle disease could survive maximum for 30 days in rural chicken. The overall immune response observed in group A, B, C and D showed that minimum G.M.T was observed in group D. This might be due to low availability of certain nutrients like proteins, vitamins and minerals because the similar low immune response under the nutritional influence was noticed by Iqbal *et al*. (1994), Sklan *et al*. (1995), Bashir *et al*. (1998) and Praharaj *et al*. (1998).

The statistical analysis of data showed that there was a significantly ($P<0.05$) higher G.M.T at 10 and 20 days post vaccination with respect to day of vaccination and reading taken at 30 days post vaccination. This trend was observed in all the groups fed on different experimental rations.

The highest G.M.T was observed in Group A while minimum G.M.T was noticed in group D. The statistical analysis revealed that the G.M.T of chicken belonging to groups A, B and C was significantly ($P<0.05$) higher than group D. Group A which was fed on the comparatively balanced ration formulated in terms of the nutritional requirement had the maximum immune response against Newcastle disease. Ration D which was formulated on basis of poor quality waste had the minimum G.M.T of 18.13. This response indicated that the composition of ration irrespective of energy and protein contents had significant influence on antibody titre subsequent to vaccination of chickens. The similar findings recorded by most of the research workers. It can be inferred from the data that the occasional high mortality observed in rural chicken can be reduced thought proper nutritional management and effective vaccination of rural flocks. The results also indicated that quality of protein has minor importance in the immune response of the chicken. Because the crude protein content of

Table 1: Composition of experimental ration percentage

Ingredients/Particulars	A%	B%	C%	D%
Maize	27	20	25	-
Rice Broken	25	2	25	-
Wheat	5	30	25	-
Rice Polish	7	-	-	-
Cotton Seed Cake	-	-	25	5
Cotton Seed Male	3.5	-	-	-
Corn Gluten Meal 60 %	2.5	-	-	-
Rape Seed Cake	-	-	12	12
Rape Seed Meal	5	-	-	-
Guar Meal	1	-	-	-
Soybean Meal	5	-	-	-
Fish Meal	5	-	-	-
Wheat Bread	-	-	-	50
Wheat Bran	-	-	-	25
concentrate Packs	-	30	-	-
Vitamins & Minerals	14	-	-	-
Green Vegetation	-	-	Ad-libitum	Ad-libitum
Chemical Composition				
Crude Protein %	16	16	16	16
Crude Fat%	4	4	4	4
Crude Fiber%	3	3	3	3
Met Energy (Kcal/Kg)	2750	2750	2750	2750
Cost Per KG(RS)	10.00	8.70	6.00	6.00

Table 2: Effect of different plans of nutrition on the immune Response of cross (FAY x RIR) chicken

	Treatments				
Group	0 Day	10 Day	20 Day	30 Day	Average
A	7.50	53.33	36.67	16.67	28.54*
B	12.50	36.67	30.00	12.50	22.92
C	18.33	50.00	30.00	11.67	27.50
D	9.17	28.33	21.67	13.33	18.13
Average	11.88	42.08*	29.59*	13.54	

*Significant ($P<0.05$)

ration does not specifically indicate the amino acid content and availability to chicken.

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