

## Effect of Different Levels of Vitamin A in Broiler Chicks on Immune Response to ND Vaccine

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### Summary

Vitamin A was added at 500 to 20000IU/kg of feed given to broiler chicks from hatching. The "HB1" strain of Newcastle disease virus was instilled into eye at 14 days of age. As a booster, the "La Sota" vaccine strain of Newcastle disease virus was taken at 15 days after primary vaccination. The immune response (hemagglutination inhibition titers 2 and 3 weeks after primary and second vaccination, respectively) was best at 500IU of vitamin A.

**Key words:** vitamin A, broiler chick, growth rate, antibody response, Newcastle disease vaccine

### Introduction

An adequate poultry ration is essential for growth, development, reproduction, and maintenance of health and life. In addition of proteins, amino acids, carbohydrates and fats, by the formulated feed, vitamins must be supplied to the poultry usually as part of the diet. Vitamins are classified in terms of their solubility in organic solvents or in water. Vitamin A (Vit A) is an organic or fat-soluble derived from plant carotens.

Because of the role of Vit A in poultry diets for growth, optimal vision and integrity of mucous membranes (Calnek *et al* 1991) poultry daily requirements of Vit A must be provided by a balanced diet. To modulate immune functions, Vit A and its different forms have been considered in the last decade. Some studies indicated that Vit A deficiency is associated with impaired immune functions and reduced resistance to infection (Samanta 1992, Sklan *et al* 1994). Both humoral and cellular immune responses of growing broiler chickens were shown to be modulated by different levels of Vit A in the diet (Lessar *et al* 1997).

The purpose of this study was to examine the effects of Vit A on humoral immune response by maintaining broiler chickens either on low, standard or high Vit A. To evaluate this response, we measured antibody response to instilled Newcastle disease (ND) vaccine by hemagglutination inhibition (HI) test.

### ***Materials and Methods***

500 one-day old male broiler chicks (Lohman breed) were selected from hens maintained on 7200IU/kg Vit A diet. Five separate feeding trials were conducted. In Trial 1, 100 chickens were fed a basal broiler diet (Mark & Donald 1990) amended with 500IU/kg Vit A. In Trials 2 to 5, four groups of 100 chicks each were fed the same basal diet amended with 3500, 7500, 10000 and 20000IU/kg Vit A, respectively. Whereas the third group of 100 chicks served as control.

All birds received their respective diet from hatch to 7 wk of age. They were weighted at the beginning of experiment and individual BW was recorded weekly. At 2 wk of age, each bird received one dose of an eye-dropping of a ND vaccine-strain "HB1" (Razi Ins., Karaj, Iran). At 2 wk of postvaccination, blood samples were taken from all of chicks from each group and the immune response was estimated by HI test. 15 days after primary vaccination a second vaccination with a live "La Sota" strain of ND vaccine (Razi Ins., Karaj, Iran) was done by instilled into the eye.

At the end of 7 wk remained birds per treatment groups were bled and the immune response was estimated by HI test. Birds were killed at the end of experiments the liver and the spleen immediately excised, and weighted. At the same time, birds were visually scored for Newcastle disease lesions and other infections.

### ***Results and Discussion***

Average body weight gains (BWG) of birds maintained on the Trials 1 and 2 were lower than BWG observed in other trials (Table 1), but that were not significantly lower ( $P < 0.05$ ) than BWG observed in birds fed the standard Vit A diets.

The antibody response to ND vaccine was affected by the level of Vit A in diet (Table 2). As expected, antibody titers increased with time in all groups but there were no significant effects on serum hemagglutination titers in response to the primary vaccination with ND vaccine. 21 days after the second vaccination, average serum antibody titer was significantly greater in chicks ( $P < 0.05$ ) raised on 500 Vit A than the control group and the other Vit A-supplemented diets.

Some of birds due to heart bleeding and disease were lost during the experiment (Table 3). Moderate signs of CRD complex were seen on the dissection of carcasses.

The results of this research reveal that growth was affected in birds fed a low Vit A diet. But the amount of Vit A can not had a direct relationship by BWG on the end of raise period. However, an increased consumption of Vit A in birds had not a marked effect on BWG.

Table 1. Average body weight (g) of experimented birds at 7 weeks

	Age(wk)	Diet (IU Vit A/kg)				
		500	3500	7500	10000	20000
First vaccination	1	128	131	130	133	131
	2	225	224	223	218	224
	3	250	272	310	314	317
Second vaccination	4	315	326	361	365	362
	5	347	372	405	407	409
	6	398	413	434	433	436
	7	410	428	441	445	454
<b>Body weight (g)</b>		296.14	309.42	329.14	332.14	338.85

Table 2. Average antibody titer to ND vaccine in experimented birds by HI test

	Trial				
	1	2	3	4	5
Primary vac.	5.9	5.7	5.4	5.1	5.2
Second vac.	8.4	7.9	7.7	7.4	7.4

Table 3. Losses of chicks fed diets containing different levels of Vit A

	Diet (IU Vit A/kg)				
	500	3500	7500	10000	20000
<b>Loss: Mechanical</b>	7	5	6	7	8
CRD complex	10	5	3	4	4
<b>Remained: Healthy</b>	66	79	79	79	77
CRD complex	17	11	12	10	11

It is observed that chicken antibody response to ND vaccine was affected by different levels of Vit A, especially by low Vit A diet. Vit A plays an essential role in maintenance of the integrity of normal barriers such as mucous membranes. So, the

reduction of Vit A in diet can result greatly increases susceptibility to infection. An increase in the antibody response to ND vaccine in chickens fed the 500 Vit A may be due to a reduced local resistance at the site of entry by ND virus.

On the other hand, Vit A may play a secondary role in systemic immune response (Davis & Sell 1989). Because of all of experimented chicks were vaccinated by a live ND vaccine, this antigen has penetrated the primary chicken defense. Increased antigenic exposure result greater serum antibody response to ND vaccine in chicks. Immune response in this study was greater in chicks fed diet supplemented with 500IU/kg Vit A. Feeding 500IU/kg Vit A daily increased the serum antibody titer to ND vaccine, and resulted in reduction in rate of body weight gain. It seems that increased antibody titer in chicks can not be means increase immune potential to infections. Reduction in Vit A in diet, as well as impair to mucous membrane, the primary defense, would allow other infective agents to entry and increase susceptibility to infections in birds (Friedman *et al* 1991, Lessard *et al* 1995).

In conclusion, despite an increase in antibody response to ND vaccination, generally development of immune system and also better immune response in the growing chicks may be achieved at diet supplemented with standard level of Vit A.

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