Effects of vitamin A supplementation in local free range chickens vaccinated with Newcastle disease vaccine in Wami Dakawa, Morogoro, Tanzania

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SUMMARY

Vitamin A is required for normal growth, reproduction and maintenance of epithelial cells chicken's tissues. In this study, the effect of vitamin A supplementation in chickens immunized with Newcastle disease virus vaccine (strain I-2) was investigated in free range local chickens in Wami-Dakawa, Morogoro region. A total of 40 chickens were divided into four groups with ten birds each namely, Group I, II, III and IV. Group I was treated vaccination and vitamin A, group II were neither vaccinated nor supplemented with vitamin A, group III were vaccinated only and group IV were supplemented with vitamin A only. There were significant increase ($p<0.05$) in immune response in vaccinated chickens supplemented with vitamin A supplement compared to chickens in other three groups. Therefore, this study suggests that vitamin A should be supplemented to scavenging local chickens during vaccination programme to increase immunization efficiency in the local chickens.

Key words: Newcastle virus disease, I-2 vaccine, scavenging local chickens,

INTRODUCTION

Newcastle virus disease is highly infectious disease of domestic poultry and wild birds caused by
Paramyxovirus Serotype-1 is a member of the genus *Avulavirus* within the larger family of *Paramyxoviridae*. The virulent form of Newcastle disease virus (NDV) causes a highly contagious and fatal disease in chickens (Nichole *et al*., 2012). Transmission occurs through contact to fecal and nasal excretions from infected birds or through contact with contaminated feed, water, equipment and plumage and aerosol transmission (Hodder *et al.,* 1993). Migratory wild birds can transmit NDV to free range poultry through direct contact or by contamination of feed or water (Killian, 2009). Vitamins are essential for chicken metabolism and utilization of nutrients. The high level of vitamin A supplementation (10,000 IU, Retinylpalmitate) had a beneficial effect on the feed intake (Lin, 2002).

Vitamin A is essential for the integrity of epithelial tissue, which represents a major defense against the entry of pathogens. In field conditions, the scavenging/free range chickens are exposed to a variety of stress factors which may adversely influence the immune system. The effect of vitamin A supplementation in chickens vaccinated with Newcastle disease vaccine is not known. Therefore the main objective of this study was to assess the effects of vitamin A supplement on the immune response of chickens vaccinated with Newcastle disease vaccine (I-2) in Wmi-Dakawa, Morogoro.

MATERIALS AND METHODS

Study design data collection

A cross sectional study was a carried out. A total of 40 healthy grower chickens of aged more than four weeks were randomly selected from 10 different households, four chickens were selected from each household. The first four birds that

came out from the house were selected for the study. Detailed clinical examination was conducted to rule out NCD, ectoparasites infestation and other diseases. A clinically sick bird was eliminated from the study. Antibody titres against NCD were determined prior to vaccination and vitamin A supplementation. The birds were divided into four experimental groups of ten birds each, namely: Groups I, II, III and IV, each group had ten birds and were subjected under different treatment of vaccination and vitamin A supplements as shown in Table 1.

Table 1: Chicken experimental groups based on different treatments

Group	Treatment
I	Vaccinated, No Vitamin A supplementation
II	Vaccinated, Vitamin A supplementation
III	Not vaccinated, No vitamin A supplementation
IV	Not vaccinated, Vitamin A supplementation

Data collection

Vaccination and supplementation of experimental birds

Vaccination of chickens (Groups I and II) was conducted by eye drop while chickens in group II and IV were orally supplemented with single dose of vitamin A (1000 I.U retinyl palmitate) on the same day of vaccination. All birds were monitored for 4 weeks and blood sampling was carried in day 0 and 20 post vaccination/supplementation. Blood sampling were conducted according to the standard method in Controlling Newcastle disease in village chickens: A Laboratory Manual ACIAR.

Determination of Antibody titres

Vaccine antibody titres were determined by the Haemaglutination inhibition test for infectivity tests and Haemaglutination test for as described in Controlling Newcastle disease in village chickens (A Laboratory Manual ACIAR, 2012).

RESULTS

The I-2 antibody titres in group I, II, III and IV were $2^{7.1}$, $2^{9.1}$, $2^{1.2}$ and $2^{1.1}$, respectively. There were significant difference in antibody titres between chickens in group II and I.

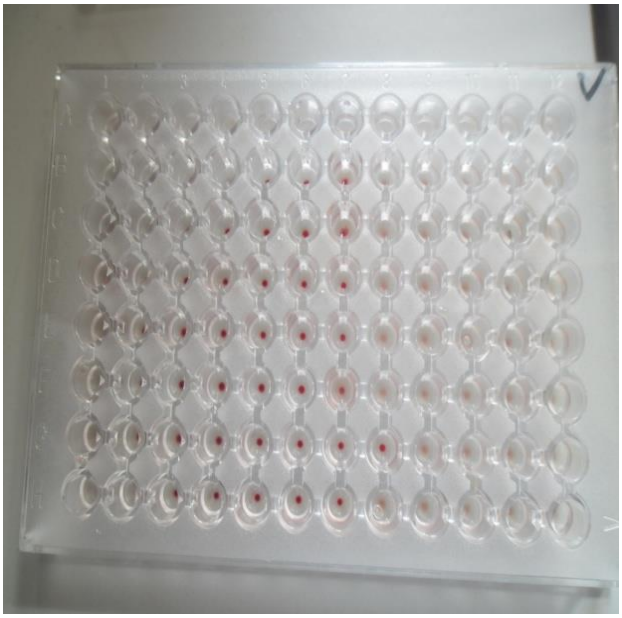

Figure 1 (a): Vaccinated only

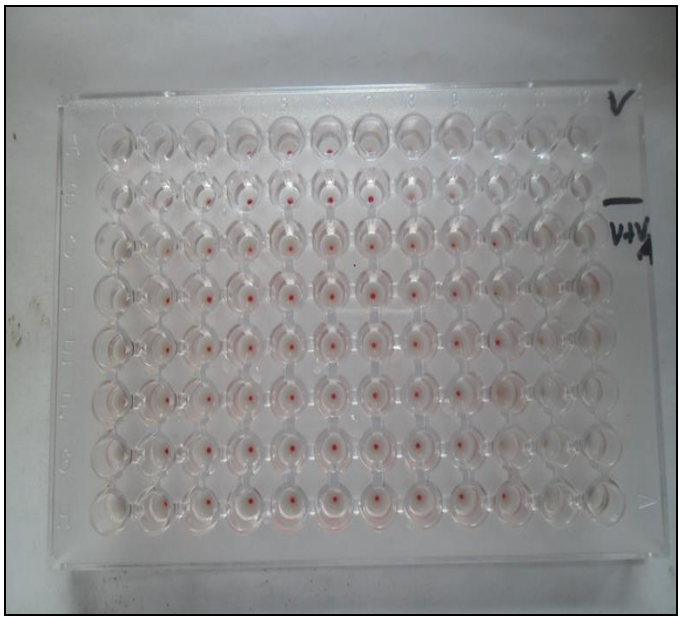

Figure1 (b): Vaccinated and supplemented

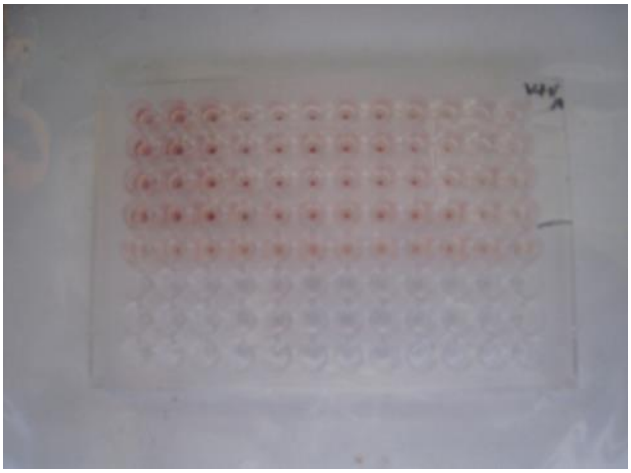

Figure 1(c): Vitamin A Supplemented only

Table 2. Antibody titre of chickens

Group I	GroupI	Group III	Group IV
Vaccine alone	Vitamin A & vaccinated	Non vaccinated	Non vaccinated
2^8	2^1	2^0	2^2
2^7	2^9	2^0	2^0
2^7	2^1	2^1	2^5
2^7	2^9	2^0	2^0
2^7	2^9	2^5	2^2
2^7	2^1	2^0	2^0
2^8	2^9	2^3	2^0
2^7	2^8	2^3	2^0
2^6	2^9	2^0	2^0
2^7	2^8	2^0	2^0

DISCUSSION

Vitamin A supplementation in scavenging local or village chickens boost the immune response against I-2 ND vaccine as shown in this experiment. Following primary immunization, the chickens deficient in vitamin A showed the lowest antibody titer. Supplementation of Vitamin A on the day of vaccination increased antibody titer. It has been demonstrated by Lin 2002 that the optimum HI titer against Newcastle disease was obtained when the feed contained 20,000 I.U. Until recently most of the studies overlooked the potential role of vitamins in optimizing immune response in the chickens, particularly in response to infections from bacteria and viruses in local village scavenging chickens (Dontwi, 2008). In populations where vitamin A availability from food is low (Stephensen, 2001) infectious diseases can precipitate vitamin A deficiency by decreasing intake, decreasing absorption, and increasing excretion. Vitamin A deficiency impairs innate immunity by impeding normal regeneration of mucosal barriers damaged by infection, and by diminishing the function of neutrophils, macrophages, and natural killer cells. Vitamin A is also required for adaptive immunity and plays a role in the development of T cells both-helper (Th) cells and B-cells (Stephensen, 2001). In particular, vitamin A deficiency diminishes antibody-mediated responses directed by Th2 cells, although some aspects of Th1-mediated immunity are also diminished. It has also been noted in this experiment that local scavenging village chickens baseline titre in some chickens is high up to 2^6. Owner said some of the chickens were bought from unrecognized sources so might have been vaccinated. It is also possible that ND is circulating in WamiDakawa. Variability in results might have been occurred due to the nature of study as it has been done on local, free range.

CONCLUSION AND RECOMMENDATIONS

Vitamin A supplementation has an effect in immune response against ND vaccine. Results showed that vitamin A supplementation (10,000 IU/kg) had a beneficial effect on the feed intake and assist in immune response to diseases or vaccine.

RECOMMENDATIONS

Supplementation of Vitamin A either on the day of vaccination or few days afterwards increased antibody titre as have been shown by this experiment. In field conditions, the chicken is exposed to a variety of stress factors which may adversely influence the immune system. Vitamin A is also required for adaptive immunity and plays a role in the development of T both-helper (Th) cells and B-cells. Therefore vitamin supplementation may be used as an adjunct to both therapeutic and prophylactic treatments. For a practical disease control program, proper vaccination procedures and an efficient immune system leading to optimum response are essential. The recommended dietary inclusion of vitamins is

aimed at preventing clinical deficiencies by administration of specific vitamins. In this experiment, Vitamin A 10,000 I.U was used but some other studies suggest up to 20,000 I.U so more studies are encouraged to conduct other trials.

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