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Short Communication

Evaluation of Newcastle Disease Vaccination Regime for Commercial Guinea Fowls Production in Kumasi, Ghana

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ABSTRACT

Newcastle disease vaccination regimes commonly used in the control of the disease in chicken abound in literature in most endemic countries however such in guinea fowl has not being previously reported especially in Ghana. This study was conducted to evaluate waning of maternal antibodies and Newcastle disease vaccination regime in keets at a private Farm in Kumasi, Ghana. 3000 keets (1000 per group) were used for the study. Group A keets were vaccinated with Hitchner B1 strain (HB 1) on day 1, Group B keets on day 7 and Group C keets were not vaccinated and served as the control group for maternal antibody waning. The antibody titres of the birds were determined from day 1 to day 28 using Enzyme-Linked Immunosorbent Assay (ELISA) test and the mean titres were calculated. The maternal antibodies waned to a very low level at day 14 while at day 28, keets in Group A produced the highest average titre of 5067.3 compared to Group B and Group C ($p<0.05$). In conclusion, vaccination of keets at day 1 seems to produce better immune response even with the presence of maternal antibodies.

Keywords: *Newcastle Disease, keets, vaccination, ELISA, Kumasi, Akate Farms*

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INTRODUCTION

Over the past decade, the Agricultural sector has re-gained attention in the sub-Saharan Africa due to its effect on rural poverty elimination, climate change, food price increases, rising population and heightened investor interests (Sumberg, 2013). The agricultural industry employs about 70 percent of the workforce in Africa and contributes an average of 30% to the continent's Gross Domestic Product (FAO, 2013).

In Ghana, agriculture was historically the dominant sector of the real economy accounting for more than 30% of GDP post-independence, although more recently, it has declined sharply and is the smallest sector of the economy as at 2016 (Ghana Budget, 2017). According to Assa (2012), poultry production is the fastest growing component in global meat production, with developing countries playing a leading role. In 2012, the total estimate of meat produced domestically was 127,038 metric tonnes of which poultry were the largest contributor representing 36.45% (SRID/MOFA, 2013). Despite this remarkable leading role of the poultry industry, high prevalence of infectious diseases has been the most serious constraint on the poultry production in Ghana. Of the poultry production, emphasis on poultry other than chicken is less.

According to FAO (2014), guinea fowl population has been estimated to be 7.1% of the total poultry population and 81% of all guinea fowls in Ghana are produced in the three northern regions. Ghana has a comparative advantage for guinea fowl production because of the relatively lower rainfall and the Guinea and Sudan Savannahs which characterize about 70% of Ghana's vegetation (Mahaka 1990: Ikani and Dafwang 2004). In the Savannah zone of northern Ghana, rural guinea fowl is common next to the local chicken (Anning, 2008) and evidently forms an integral part of the farming system in these areas (FAO, 2014). Guinea fowl meat is high in protein and low in fat content compared to chicken meat. It is a good source of vitamin B6, selenium and niacin whilst guinea fowl eggs especially are considered a delicacy (Teye and Adam, 2000). The government of Ghana has invested in enhancement of local guinea fowl production which necessitated the need to embark on commercial guinea fowl production to augment local chicken production, however the routine vaccination

regime for control of some known poultry diseases that threatens guinea fowl commercial production is not in place. Newcastle disease (NCD) is a major disease of poultry presenting a worldwide problem and threatening the poultry industry, affecting poultry producers, backyard farmers, and the economies of entire nations (Miller, 2008). It is also one of the main sanitary barriers for the free trade of poultry and poultry products (OIE, 1996). To curb this issue, routine ND virus vaccination practiced in countries where virulent strains of the Newcastle Disease virus are endemic (Senne et al., 2004). Studies on vaccination regimes to curb the menace of Newcastle disease abound in literature with less emphasis on guinea fowl which has also be shown to be susceptible to Newcastle disease virus (Baba et al., 2006, Paulillo et al., 2008).

In Ghana, the major issues leading to the vaccine failures had been vaccination regime, handling of vaccines, impotent vaccines and interference of MDA among other factors. The issue of the optimal timing of vaccinations especially against Newcastle disease is also of major concern hence the need to know the level of maternal antibodies against Newcastle disease especially in keets. The waning pattern of MDA in keet will inform the appropriate timing for Newcastle disease vaccination, such information is lacking in Ghana. This study investigates the waning pattern of maternal antibodies in keets and appropriate vaccination regime to prevent Newcastle disease in a commercial guinea fowl farm in Kumasi, Ghana.

MATERIALS AND METHODS

Study Area: The study was conducted at Akate farms, Nwamase, in the Kwabre East district, Ashanti region with a digital address of AK-147-7593. Akate Farms was chosen because it is one of the largest and recognised poultry farms in Ghana with a commercial hatchery for guinea fowls with average production of 10,000 keets per week.

Study Design: The study was a field experimental study using three population groups. The first population group labelled as Group A was vaccinated on Day 1, the second population labelled as Group B was vaccinated on day 7 and third population group was used as the control group with no vaccination.

Study Population and Experimental Design: A total of two thousand and one hundred (2100) keets were purposively recruited for the study. The total population was divided into three groups A (1000 keets), B (1000 keets) and C (100 keets). Each group had a pen. All the keets were subjected to the same management practices and protocol. Keets in Groups A and B were vaccinated whilst keets in Group C served as the control group for the experiment. All vaccinations were done using Hitchner B1 strain (HB1).

Vaccination was carried-out for Groups A and B on day 1 and day 7 respectively. Each keet in Group A was vaccinated with HB1 on day 1. For Group B, the keets were vaccinated with HB1 by spraying at 1000 doses per 1000 birds on day 7. Keets in Group C were not vaccinated.

Blood sample collection and Analysis: Approximately 1-3mls of blood was collected from the wing vein of 25 randomly selected keets from each pen for Group A, Group B and Group C into a plain tube which was made to stand for the blood to clot and for the serum formation. Samples were taken on Day 1, Day 7, Day 10, Day 14, Day 21 and Day 28 post hatch. Sera were analysed for Newcastle disease antibodies using Enzyme-Linked Immunosorbent Assay (ELISA).

Data Analysis

Data obtained on the antibody titre values were subjected to descriptive analysis to obtain the means for each population group of keets. The mean titre (MT) of each sample group was obtained after ELISA test. Results were obtained for all three study groups and presented in tables and graphs. Analysis of variance test was carried out on the data to compare the mean differences between the groups at 5% significant level (p=0.05) using SPSS version 20.

RESULTS

Antibody titre of keets at vaccine administration days: The results on ND antibody titre of keets at days of vaccine administration are as shown in Table 1. The mean maternal antibody titres of keets in group A was 532.5, group B was 532.5 and group C was 533.5 at day 1. At day 7, the GMT of the groups decreased with group B keets recording the highest.

Table 1. GMT of Newcastle Disease Antibody titre of keets at days of vaccine administration

	Geometric Mean Titre (GMT)		
Groups	**Day 1**	**Day 7**	***p***
A (HB1 vaccine at Day 1)	532.5±	258±	0.040*
B (HB1 vaccine at Day 7 via spray)	532.5±	300±	
C (control = no vaccine)	533.5±	298.8±	

**=significant mean differences at p≤ 0.05*

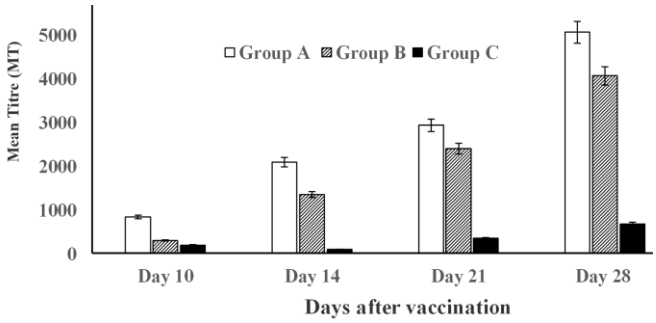

Figure 1.
Newcastle Disease antibody titres in keets after vaccination

Antibody titre of keets days after vaccine administration: Results on the antibody response generated after vaccines were administered on day 1 to group A and day 7 to group B keets are shown in Figure 1. It was observed that on day 10, the titre value had increased in group A but had decreased in groups B and C. At day 14, the titre value in groups A and B increased whilst that of group C decreased. The mean differences were statistically significant (p<0.05).

The ND antibody titre for keets in Group A kept increasing from day 21 till day 28. A similar pattern was recorded for the keets in group B. Again, the pattern of increase in titre values was seen in keets in group C at days 21 and 28 respectively (Figure 1). These mean titre differences were found to be statistically significant ($p<0.05$).

DISCUSSION

This study focused on evaluating the Newcastle disease vaccination schedule in keets at Akate farms in Kumasi, Ghana. The findings of the study revealed the presence of maternal antibody titres in the keets at day old which drastically reduced to a very low level at day 14. This showed that the maternal antibodies waned around day 14. The increasing titres observed at day 21 and day 28 could be attributed to field exposure to Newcastle disease virus because the farm is an endemic area for the ND virus.

The increasing titres observed in groups A and B showed the seroconversion of the keet to the vaccine given, however, the conversion in group A was higher than that of group B which showed that giving ND vaccine at day old is better than day 7, it also showed that there is little interference of maternal antibodies in the seroprofile in the two vaccination regime employed.

In conclusion, vaccinating keets at Day 1 and Day 7 helps keets to build good immune response with a good level of antibody titres produced. It is recommended that farmers in commercial production of guinea fowls should be encouraged to vaccinate their keets against Newcastle disease at Day 1 or 7.

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