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Detection of antibody to Newcastle disease virus in semi-domesticated free-range birds (*Numida meleagris* and *Columba livia domestica*) and the risk of transmission of Newcastle disease to village chickens - short communication

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ABSTRACT

A seroprevalence study for Newcastle disease (ND) in semi-domesticated birds was carried out in Morogoro Municipality. The results showed that haemagglutination-inhibition (HI) antibodies to Newcastle disease virus (NDV) were detected in 75% (n = 36) and 10% (n = 20) of serum samples collected from guinea fowl and pigeons, respectively. Studies have shown that guinea fowl and pigeons are susceptible to NDV. In village husbandry practices, by which different species of birds are raised together in the same compound, the risk of the transmission of NDV from guinea fowl and pigeons to village chickens may arise. Therefore there is a need to conduct regular and strategic vaccination programs against ND for chickens, guinea fowl and pigeons in village settings.

Key words: Newcastle disease, guinea fowl, antibody, pigeon

Introduction

Newcastle disease (ND) is the most economically important disease in poultry, especially in village chickens in developing countries. It is caused by the Newcastle disease virus (NDV) within the genus *Avulavirus,* in the family *Paramyxoviridae* (MAYO, 2002).

Newcastle disease virus can infect many species of domestic and wild birds. Domestic fowls, turkeys, pigeons and parrots are most susceptible. A milder form of the disease is

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seen in ducks, geese, pheasant, quail, guinea fowl and canaries. Certain strains of NDV have become adapted to pigeons in some countries and cause disease in both pigeons and chickens. Guinea fowl may be infected and pose a danger to local and commercial chickens (SPRADBROW, 1999). However, once chickens are affected with NDV, they become a source of infection for subsequent ND outbreaks (SPRADBROW, 1999).

ROY et al. (1998) reported that birds other than domestic chickens have been known to be sources of the spread of ND virus. It was reported previously by ALEXANDER et al. (1984) that the spread of ND virus to chickens has occurred in several countries as a result of feed contaminated by the faeces of ND infected pigeons. DILAVERIS et al. (2007) reported that unvaccinated birds can become infected by NDV of pigeon origin, as exemplified by the 2006 case of ND in Scotland.

Newcastle disease outbreaks have been reported in guinea fowl in some African countries, such as Nigeria and Niger (ECHEONWU et al., 1993; IDI et al., 2001). OLADELE et al. (1996) reported serological evidence of ND infection in pigeons in Nigeria. Moreover, velogenic NDV from pigeons was isolated in India and was able to induce ND in chickens without prior adaptation (ROY et al., 2000). The *Paramyxovirus*-1 (pigeon group) has been reported to cause severe outbreaks of ND in fancy *Columba livia* in Saudi Arabia (ABU ELZEIN et al., 1999).

This study was conducted to determine the serological prevalence of ND in semi-domesticated birds; guinea fowl (*Numida meleagris*) and pigeons (*Columba livia domestica*), and their role in the transmission of ND to domestic birds.

Materials and methods

Serum samples. Twenty (20) and thirty-six (36) blood samples were aseptically collected from pigeons and guinea fowl, respectively. The blood from each bird was kept in syringes and left at room temperature overnight, then the serum was separated and frozen for subsequent use. Blood samples were collected from the selected areas in Morogoro Municipality as shown in Table1.

Haemagglutination and haemagglutination-inhibition tests. A 0.25% suspension of red blood cells (RBCs) was prepared for use in haemagglutination (HA) and haemagglutination inhibition (HI) tests (ALLAN and GOUGH, 1974). The HA titres of the ND I-2 antigen were determined as described by ALLAN and GOUGH (1974), and ALLAN et al. (1978) and diluted to contain 4-HA units. This concentration was used for the HI test. The HI titre for each bird was determined and expressed in $\log_2$, and the geometric mean for each species was calculated. An HI titre ≥ 2 $\log_2$ was considered positive.

Results

The results in Table 1 showed that ND antibody prevalence was higher in guinea fowl than in pigeons, 75% and 10%, respectively. Interestingly, pigeons recorded higher NDV antibody titres than guinea fowl, although a large proportion of pigeons were negative to NDV antibody.

Table 1. Seroprevalence of Newcastle disease in semi-domesticated free range birds from selected areas of Morogoro municipality

Species of birds	Areas	Number tested	Number positive	Geometric mean HI titres (log_2)
Guinea fowls	Kivuma	5	4	4
	Kapere	5	1	3
	Forest	2	1	2
	Kihonda	10	10	4
	Mafiga	14	11	5
Pigeons	Vibandani	5	2	6
	Magadu	5	0	<1
	Modeco	10	0	<1

None of the birds used in this study presented with any clinical signs consistent with ND; they were clinically normal.

Discussion

The results of the present study showed serological evidence of NDV in pigeons and guinea fowl in Morogoro Municipality. A high percentage of pigeons in Nigeria have been shown to be positive for antibodies to ND virus, although the titre was low (SAI'DU et al., 2004). Conversely, the results of the present study showed a low percentage of pigeons with NDV antibody but with high titre. Pigeons can be a source of infection for domestic poultry, either directly, or by contaminating poultry feed. This was exemplified by ND outbreaks in unvaccinated chickens, as a result of consuming feed contaminated by the faeces of infected, but clinically normal pigeons (ALEXANDER et al., 1984).

It is also important to conduct further studies on the role of semi-domestic birds, including pigeons, in the epidemiology of ND in other areas in Tanzania, since it has been reported that pigeons play a role in the epidemiology of ND in other countries (ALEXANDER et al., 1984; VINDEVOGEL and DUCHATEL, 1988; ROY et al., 2000).

In the present study, results showed that guinea fowl exhibited a higher prevalence of ND antibodies. These results corroborate findings from previous studies conducted

in other African countries by COURTECUISSE et al. (1990), IDI et al. (2001) and MAI et al. (2004). Moreover, isolated natural outbreaks of ND in guinea fowl have been reported in Nigeria and Niger (OKAEME et al., 1988; HARUNA et al., 1993; ECHEONWU et al., 1993; IDI et al., 2001). Guinea fowl seem to be susceptible to NDV, and village husbandry practices, by which different species of birds are raised together in the same compound, may pose a risk of transmitting NDV from guinea fowl to village chickens (IDI et al., 2001; SA'IDU et al., 2004; MAI et al., 2004).

Moreover, the study conducted by OTIM et al. (2007) indicated that other domestic and wild birds are among the risk factors associated with ND outbreaks in free-ranging village chickens in Uganda.

Based on the above findings, there is therefore a need to conduct regular, strategic vaccination programs against ND for local chickens, guinea fowl and pigeons in village settings. The same recommendation has also been put forward by several others (IDI et al., 2001; SA'IDU et al., 2004; MAI et al., 2004). The challenge is that it might be difficult to vaccinate these feral birds against ND using the conventional techniques at hand. It is evident that innovative techniques are required.

Recently there have been developments in the application of oral vaccines in chickens, through the use of oiled rice coated with I-2 ND vaccine (WAMBURA et al., 2007). Similar techniques may also be used in guinea fowl, pigeons and other semi-domesticated birds. In lieu of this, attempts are being made to vaccinate village chickens and guinea fowl against ND by using oiled rice coated with thermostable NDV strain I-2.

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SAŽETAK

Istraživanje seroprevalencije newcastleske bolesti u poluudomaćenih ptica provedeno je u okrugu Morogoro. Protutijela inhibicije hemaglutinacije za virus newcastleske bolesti bila su dokazana u 75% (n=36) pretraženih uzoraka seruma biserki i 10% (n = 20) uzoraka seruma golubova. Istraživanje je pokazalo da su biserke i golubovi prijemljivi na virus newcastleske bolesti. U seoskim gospodarstvima, gdje se različite vrste ptica uzgajaju zajedno u istom prostoru, postoji rizik za prijenos virusa newcastleske bolesti s biserki i golubova na domaću perad. Stoga je potrebno osmisliti i poduzeti program cijepljenja pilića, biserki i golubova u seoskim gospodarstvima protiv newcastleske bolesti.

Ključne riječi: newcastleska bolest, biserka, golub, protutijela