

Prevalence of Newcastle disease antibodies in domestic and semi-domestic birds in Zaria, Nigeria

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ABSTRACT

Out of 380 birds sampled, 128 (35.7%) were galliformes, 100 (28.6%) anseriformes, while 100 (28.6%) were columbiformes and 25 (7.1%) struthioformes. Haemagglutination Inhibition (HI) test was used for detection and quantification of antibodies against Newcastle Disease (ND) virus. The HI titre of each bird was determined and expressed in \log_2 and the mean for each species was calculated. Of the galliformes tested, 92% of the chickens tested were positive, as were only 12% of the quails tested. Among the columbiformes tested, 44% of domestic pigeons tested were positive, as were 24% of mourning doves tested. The only species tested among the struthioformes was the ostrich, of which 52% were positive to ND virus antibodies. The mean HI titre for local chickens was 7.3 \log_2 , 0.4 \log_2 for quails, 0.1 for Khaki Campbell, 0.4 \log_2 for laughing dove and 1.9 \log_2 for ostrich. Galliformes were more susceptible to ND virus than all the other families tested. Anseriformes seem to be less susceptible to ND virus, although a high percentage of Muscovy ducks were positive to ND virus antibodies. Domestic pigeons and turtle doves were more susceptible to ND virus than other members of the columbiformes tested. Although there is no report of a clinical outbreak of ND in anseriformes and columbiformes in Nigeria, they are nevertheless infected with ND virus and may therefore serve as reservoirs of ND virus for galliformes.

Key words: Newcastle disease, antibodies, galliformes, anseriformes, columbiformes, struthioformes

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Introduction

Over 200 species of birds have been reported to be susceptible to natural and/or experimental infection with ND virus and it seems probable that more are fully susceptible (ALEXANDER, 1999).

Ducks and geese tend to show few signs even when infected with the most virulent strains of ND virus for chickens (ALEXANDER, 1999). Although many species of bird are susceptible to ND it occurs mainly in galliformes such as pheasants, partridges and quails and also in birds of prey, including owls, pigeons and psittaciformes. In most species of bird the young are more susceptible than the adult (ARNALL and KEYMER, 1975). Prior to 1971 no case of natural infection with ND virus was observed in pigeons. However, an outbreak of epidemic proportions decimated aviculture in Europe between 1971-1973 (VINDEVOGEL and DUCHATEL, 1988).

Birds other than the domestic chicken have been known to be sources of the spread of ND virus (LANCASTER, 1963; ROY et al., 1998). It was reported by ALEXANDER et al. (1984) that the spread of ND virus to chickens has occurred in several countries, including Great Britain, where 20 outbreaks in unvaccinated chickens occurred in 1984 as a result of feed that had been contaminated by faeces of infected pigeons.

In rural Nigeria, it is common to find a combination of different poultry species and breeds being kept in the same compound (IBRAHIM and ABDU, 1992), including chickens, turkeys, Muscovy ducks and pigeons. Also, non-domesticated species such as turtle doves are regularly seen around human dwellings. At present it is customary to find ostriches, peacocks, geese and mallard ducks in the same compound in cities and in some poultry farms.

In Nigeria ND was reported in guinea fowls and a highly velogenic strain of ND virus was isolated from apparently healthy ducks (ECHEONWU et al., 1993). A suspected outbreak of ND in young ostrich was also reported by SA'IDU et al., (1999). To date, there has only been serological evidence of ND infection in pigeons in Nigeria (OLADELE et al., 1996).

This study was designed to find serological evidence of ND virus infection in domestic, semi-domestic and wild birds in Nigeria, with the aim of determining their role in the epidemiology of ND in both local and exotic chickens.

Materials and methods

Serum samples. Blood of local chickens, guinea fowl and Muscovy ducks was collected in test tubes from the abattoir in the Sabon gari market of Zaria, Nigeria. Twenty-five samples were collected from each species.

Turkeys, peacocks, quails, mallard ducks, geese, Khaki Campbell ducks and ostriches were bled through the wing vein. Pigeons, laughing doves, mourning doves and turtle doves were purchased from the market and bled via the wing vein.

Chicken red blood cells (RBC). A 0.25% suspension of RBC was prepared for use in haemagglutination (HA) and haemagglutination inhibition (HI) tests (ALLAN and GOUGH, 1974).

Antigen. ND La Sota virus antigen obtained from National Veterinary Research Institute (NVRI, Vom) was used as the antigen for HI test. The HA titres of the ND La Sota 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 mean for each species was calculated.

Results

Of the 25 local chickens sampled, 23 (92%) were positive for ND virus antibodies, while 19 (76%), of the 25 guinea fowls sampled were positive. Similarly, 17 (68%) of the 25 turkeys tested were positive, while 19 (76%) of the 25 peacocks sampled also showed positive results. Of the 25 quails tested only 3 (0.1%) tested positive for ND virus antibodies. The mean HI titre for chickens was $7.3 \log_2$; $4.1 \log_2$ for guinea fowls, $4.7 \log_2$ for turkeys, while the mean HI titre for peacocks was $2.1 \log_2$ and $0.4 \log_2$ for quails (Table 1).

Eleven (44%) of the 25 Muscovy ducks were positive for ND antibodies, 5 (0.2%) of 25 mallard ducks, 8 (0.3%) of 25 geese, and only 1 (0.04%) of 25 Khaki Campbell ducks sampled were positive for ND virus antibodies. Mean HI titre for Muscovy ducks was $1.5 \log_2$, $1.0 \log_2$ for mallard ducks, $1.0 \log_2$ for geese and $0.12 \log_2$ for Khaki Campbell ducks (Table 2).

Table 1. Mean HI ND virus antibody titre of galliformes

Species of bird	N° tested	N° positive	Percent (%) positive	Mean HI titre (log ₂)
Local chicken	25	23	92.0	7.3
Guinea fowl	25	19	76.0	4.1
Turkey	25	17	68.0	4.7
Peacock	25	19	76.0	2.1
Quail	25	3	12.0	0.4

Table 2. Mean HI ND virus antibody titre of anseriformes

Species of bird	N° tested	N° positive	Percent (%) positive	Mean HI titre (log ₂)
Muscovy duck	25	11	44.0	1.5
Mallard duck	25	5	20.0	1.0
Khaki Campbell duck	25	1	4.0	0.1
Goose	25	8	32.0	1.0

The number positive for ND virus antibodies were 11 (44%), 5 (0.2%), 6 (0.24%) and 11 (44%) of 25 each of pigeons laughing doves, mourning doves and turtle doves sampled (Table 3).

Table 3. Mean HI ND virus antibody titre of columbiformes

Species of bird	N° tested	N° positive	Percent (%) positive	Mean HI titre (log ₂)
Pigeon	25	11	44.0	1.6
Laughing dove	25	5	20.0	0.4
Mourning dove	25	6	24.0	0.6
Turtle dove	25	11	44.0	2.0

Thirteen (53%) of ostriches tested were positive for ND virus antibodies; mean HI titre was 1.9 log₂ (Table 4).

Table 4. Mean HI ND virus antibody titre of struthioformes

Species of bird	N° tested	N° positive	Percent (%) positive	Mean HI titre (log ₂)
Ostrich	25	13	52.0	1.9

Discussion

ARNALL and KEYMER (1975) reported that of all families of bird, galliformes are the most susceptible to ND. It is important to note that even among the galliformes, the local chicken has the highest mean HI antibody titre than all other galliformes tested. This could mean that the chicken is more susceptible to ND viral infection than all other species of bird tested. A similar finding was reported by other workers (BELL and MOULOUDI, 1988; ALDERS and SPRADBROW, 2001). In Nigeria, there are very few reports of natural outbreaks of ND in guinea fowl (OKAEME, 1983; OKAEME et al., 1988; HARUNA et al., 1993; ECHEONWU et al., 1993) and turkeys (SA'IDU et al., 1994), although to date there has been no report of a clinical outbreak of ND in peacocks. Guinea fowl, turkeys and peacocks are susceptible to ND and local husbandry practices, where different species of birds are raised together in the same compound, encourage cross infection by ND virus among the different species. The low HI antibody titre recorded in quails may be a source of concern because quails are reported to be among the species of bird that are highly susceptible to ND (ARNALL and KEYMER, 1975). It is also important to note that despite the high percentage of peacocks that were positive for ND viral antibodies, the mean HI titre of $2.1 \log_2$ is below the protective level (LANCASTER, 1963). Therefore, in the event of infection by ND virus, antibodies may not be able to protect the birds against ND. It is again important to note that owners of peacocks in Zaria and other parts of Nigeria seldom report sickness and death to a veterinary clinic. This may explain why there has been no report of a natural outbreak of ND in peacocks in Nigeria.

A high percentage of Muscovy ducks tested in this study were positive, but despite this fact the mean HI titre was $1.5 \log_2$, which is the highest value for all the anseriformes tested. This may be due to the fact that the blood samples were collected from the abattoir and bird traders around the abattoir, such birds are usually indiscriminately mixed without regard to age, sex, and species, or whether they are sick or healthy. Indeed, most of the birds traded in the local markets or around the abattoirs are afflicted with one disease or other (IBRAHIM and ABDU, 1992). It was reported that anseriformes are resistant to infection by ND virus (ARNALL and KEYMER, 1975), and a highly virulent ND virus was isolated from apparently healthy

ducks around Jos, Nigeria (ECHEONWU et al., 1993). It is also significant that ortho- and paramyxo- viruses were isolated from water fowl in the United Kingdom and that water fowl have been incriminated in the epidemiology of ND during the 1997 ND epizootic outbreak in the U.K. (GRAHAM et al., 1997). Although the mean HI titre for the different species of anseriformes tested was low, ranging from 0.1 log₂ to 1.5 log₂, the anseriformes may serve as carriers of ND virus and may spread the virus to other poultry species which are highly susceptible, particularly local and exotic chickens.

A high percentage of domestic pigeons and turtle doves were positive for antibodies to ND virus. This finding may be explained by the fact that domestic pigeons and turtle doves are more closely associated with human dwellings. Although the turtle dove is not domesticated it does, however, lay and hatch its eggs in nests constructed in the eaves of roofs or on branches of trees located in or around human settlements. Thus, because of this close affinity for human habitation, villagers have developed the habit of placing broken pots and similar discarded items on free tops or eaves of roofs to serve as nests for the turtle dove in particular, and to a lesser extent for the laughing dove. The mourning dove rarely visits or nests around human habitations. Despite the low HI titres observed in pigeons and in some species of doves in this study, they could serve as a source of infection for both local and exotic chickens. This observation has been demonstrated by the 20 ND outbreaks in Britain that were reported in unvaccinated chickens as a result of consumption of feed that was contaminated by droppings from infected but clinically normal pigeons. (ALEXANDER et al., 1984).

More than half of the ostriches tested were positive for ND antibodies, but the mean HI titre was 1.9 log₂, which is below the protective level (LANCASTER, 1963). The ostrich is also reported to be susceptible to ND (ARNALL and KEYMER, 1975). The implication of this finding is that ostrich flocks around Zaria are at high risk in the event of infection by ND virus, and the morbidity and mortality may be high. However, to date there has been only one reported suspected outbreak of ND in an ostrich flock in Zaria (SA'IDU et al., 1999).

From the findings of this study it can be concluded that free-flying birds such as pigeons, laughing doves, turtle doves and mourning doves, may serve as reservoirs for ND virus for chickens. Similarly, anseriformes including Muscovy ducks, mallard ducks, geese and Khaki Campbell ducks may also serve as reservoirs of ND virus for chickens. Any outbreak of ND in quails, peacocks and ostriches could be catastrophic for farmers, as morbidity and mortality rates could attain very significant economic proportions. There is a need to routinely vaccinate local chickens, guinea fowls, peacocks, quails and ostriches against ND. It is also important to conduct further studies on the role of pigeons in the epidemiology of ND in Nigeria, since it has been reported that pigeons play a role in the epidemiology of ND in Europe (ALEXANDER et al., 1984).

References

- ALEXANDER, D. J. (1999): Paramyxoviridae (Newcastle disease and others) In: Poultry Diseases. 4th ed. (Jordan, F.T.W, M. Pattison, m Eds.) W. D. Saunders and Company Limited London. PP. 139-155.
- ALEXANDER, D. J., G. PEARSON, R. MARSHAL (1984): Infection of fowls with Newcastle disease virus by food contaminated with pigeon faeces. *Vet. Rec.* 115, 601-602.
- ALDERS, R., P. SPRADBROW (2001): Controlling Newcastle Disease in Village Chickens, a Field Manual-Australian Center for International Agricultural Research (ACIAR), Canberra, Australia.
- ALLAN, W. H., R. E. A. GOUGH (1974): Standard haemagglutination inhibition test for Newcastle disease: A comparison of macro and micro methods. *Vet. Rec.* 95, 120-123.
- ALLAN, W. H., J. E. LANCASTER, B. TOTH (1978): Newcastle disease vaccines. Their Production and Use: FAO Animal Production and Health Series, No. 106 pp. 50-69.
- ARNALL, L., I. P. KEYMER (1975): Bird Diseases. Baillere and Tindall, 8 Henrietta Street London PP. 451-459.
- BELL, J. G., S. MOULOUDI (1988): A reservoir of virulent Newcastle disease virus in village chicken flocks. *Prev. Vet. Med.* 6, 37-42.
- ECHEONWU, G. O. N., C. I. IREOGBU, A. C. EMERUWA (1993): Recovery of velogenic Newcastle disease virus from dead and healthy free roaming birds in Nigeria. *Avian Pathol.* 22, 383-387.
- GRAHAM, D. A., A. GERMAN, D. ABERMETHY, S. I. McCWLLOUGH, R. J. MAXWELL, D. J. ALEXANDER (1997): Isolation of Ortho- and Paramyxoviruses from wild birds in Northern Ireland during the 1997 Newcastle disease epizootic. *Vet. Rec.* 145, 20-21.

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- HARUNA, E. S., D. SHAMAKI, G. O. N. ECHEONWU, K. A. MAJIYAGBE, Y. SHA'AIBU, D. F. C. (1993): A natural outbreak of Newcastle disease in guinea fowls (*Numida meleagris galeata*) in Nigeria. Rev. Sci. Tech. Int. Epiz. 12, 888-893.
- IBRAHIM, M. A., P. A. ABDU (1992): Ethnoagroveterinary perspectives of poultry management, health and production among the Hausa/Fulani of rural Nigeria. Proceeding of the 29th Annual General Meeting of Nigerian Veterinary Medical Association. 27th–30th October, Kaduna, Nigeria, pp. 172-181.
- LANCASTER, J. E. (1963): Newcastle disease. Methods of spread. Vet. Bull. 83, 221-226.
- OKAEME, A. (1983): Diseases of young helmet guinea fowl in Nigeria. Bull. Anim. Hlth. Prod. Afri. 29, 317-319.
- OKAEME, A. N., A. D. FULURONSHO, B. A. FALAYI (1988): An outbreak of Newcastle disease in guinea fowl (*Numida meleagris meleagris*) in Nigeria. Bull. Anim. Hlth. Prod. Afri. 30, 176-178.
- OLADELE, S. B., H. M. KAZEEM, M. A. RAJI (1996): Survey for antibodies to infectious bursal disease, Newcastle disease and fowl pox in ducks, pigeons and guinea fowls in Zaria. Nig. Vet. J. 1, 85-87.
- ROY, P., A. T. VENUGOPALAN, R. MANVELL (1998): Isolation of Newcastle disease virus from an Indian house crow. Trop. Anim. Hlth. Prod. 30, 177-178.
- SA'IDU, L., P. A. ABDU, S. U. ABDULLAHI (1994): Diseases of turkeys diagnosed in Zaria from 1982-1991. Bull. Anim. Hlth. Prod. Afri. 42, 25-30.
- SA'IDU L., P. A. ABDU, S. T. HUA, K. OYELOLA, M. A. RAJI (1999): Suspected Newcastle and mycomycosis in a flock of seven-week-old ostrich. Zariya Vet. 6, 155-157.
- VINDEVOGEL, H., J. P. DUCHATEL (1988): Panzootic of Newcastle disease virus in pigeons. In: Newcastle Disease (Alexander, D. J. Ed.). Kluwer Academic Publishers, 101 Philip drive, Assinippi park Norwell Massachusetts, 62061, pp. 184-196.

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SAŽETAK

Od 380 pretraženih uzoraka seruma, 128 (35,7%) bilo je podrijetlom od ptica reda kokoški, 100 (28,6%) reda guščarica, 100 (28,6%) reda golubovki i 25 (7,1%) reda nojevki. Reakcija inhibicije hemaglutinacije (IHA) rabljena je za dokazivanje protutijela za virus newcastleske bolesti (NB). Titri protutijela IHA izraženi su kao log₂ te je srednja vrijednost izračunata za svaku vrstu. Od pretraženih kokoški pozitivno je bilo 92% pilića te 12% prepelica. Od golubovki pozitivno je bilo 44% domaćih golubova kao i 24% sivoglavih gututki. Jedina vrsta od pretraženih nojevki bio je noj s 52% serološki

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pozitivnih za virus NB. Srednji titar protutijela IHA za piliće iznosio je $7,3 \log_2$, za prepelice $0,4 \log_2$, za patku Khaki Campbell $0,1$, za plavokrilu grlicu $0,4$ te za noja $1,9 \log_2$. Kokoške su se pokazale osjetljivijima na virus NB od ostalih pretraženih vrsta ptica. Guščarice su čini se manje osjetljive na virus NB iako je ustanovljen velik postotak pozitivnih mošusnih pataka. Domaći golubovi i grlice nisu bili osjetljiviji od ostalih pretraženih vrsta golubovki. Premda nije bilo izvješća o kliničkoj pojavi NB u guščarica i golubovki u Nigeriji, ovo istraživanje pokazuje da one mogu biti zaražene virusom NB i da mogu služiti kao njegov rezervoar.

Ključne riječi: newcastleska bolest, protutijela, kokoške, guščarice, golubovke, nojevke
