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Seroprevalence of Infectious Bursal Disease in Flocks of Indigenous Nigerian Ducks (*Anas platyrhynchos*)

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Abstract: A serological survey was conducted to determine the prevalence of Infectious Bursal Disease (IBD), using the quantitative Agar Gel Precipitin Test (AGPT), in flocks of apparently healthy, unvaccinated adult indigenous Nigerian ducks in Oyo and Osun states of Nigeria. Of the 126 sera tested, 24 (19.1%) were positive for IBDV precipitins. None of the 15 samples from Farm A was positive but 9 (30.0%) from Farm B and 15 (18.5%) from backyard flocks were positive for IBDV antibodies. 15 of the positive samples had a titre of 1:16, 6 had titre of 1:32 while 3 had titre of 1:64. The Geometric Mean Titre (GMT) for the Farm B and indigenous duck samples were 21 and 23, respectively. This range of antibody titres detected in unvaccinated ducks is an indication of previous exposure to IBDV and is sufficiently high to suggest that indigenous Nigerian ducks have an important role in the natural history of IBD and could serve as carriers of the virus, thereby complicating IBD control measures.

Key words: Seroprevalence, infectious bursal disease, agar gel precipitin test, ducks

INTRODUCTION

Infectious Bursal Disease (IBD) is an acute, highly contagious viral infection of young chickens that has lymphoid tissue as its primary target with a special predilection for the bursa of Fabricius (Lukert and Saif, 2003). It was first reported in Nigeria by Ojo *et al.* (1973) and confirmed by Onunkwo (1975). Subsequent studies show that the disease has acquired an endemic status among the Nigerian poultry population (Nawathe *et al.*, 1978; Onunkwo, 1978; Okoye and Uzoukwu, 1982; Durojaiye *et al.*, 1984; Abdu, 1988).

Natural infections of IBD were thought to occur only in chickens until McNulty and others (McNulty *et al.*, 1979) reported the isolation of the IBD virus (IBDV) from turkeys in Northern Ireland. Subsequently, natural infections of turkeys and ducks (Page *et al.*, 1978; McFerran *et al.*, 1980) and artificially reared pheasants (Louzis *et al.*, 1979) have been reported. Experimental infections of turkeys were also reported by Giambrone *et al.* (1978) and Weisman and Hitchner (1978) while Van den Berg *et al.* (2001) could not produce clinical signs or lesions following experimental inoculation of pheasants, partridges, quails and guinea fowl with very virulent IBDV (vvIBDV). Moreover, Okoye and Okpe (1989) reported that experimentally infected guinea fowl did not develop lesions or antibodies. In contrast, Adewuyi *et al.* (1989) detected both lesions and IBDV antibodies in experimentally infected guinea fowl keets. Serologic evidence of IBDV presence in cordon bleu and village weaver (Nawathe *et al.*, 1978) and cattle egrets and pigeons (Fagbohun *et al.*, 2000) indicate that natural infections do occur in these species. However, although some workers (Hirose and Hirai, 1976; Okoye, 1988) did not detect IBD precipitins in duck egg yolks and sera after field surveys, IBDV antibody was detected in some studies (Eddy, 1990; Tsai *et al.*, 1996) following experimental infection of ducks while it was absent in others (Okoye *et al.*, 1990).

With their highly prolific and hardy nature, indigenous Nigerian domestic ducks *Anas platyrhynchos* have become increasingly important as an alternative source of poultry protein in Nigeria where many households keep them, along with indigenous chickens, not only to supplement the family protein intake, but also to serve as a source of income for the family. This close rearing of ducks and chickens, which has become a tradition in most urban and peri-urban households in Nigeria, could serve to sustain IBDV activity in the environment. This study aims at determining the role of these indigenous ducks in the epidemiology of IBD in Nigeria.

MATERIALS AND METHODS

Study location: The indigenous Nigerian domestic ducks used for this study were obtained from two commercial poultry farms, A and B, in Oyo and Osun States of

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Southwest Nigeria with history of IBD outbreaks in chickens and from several backyard flocks in Ibadan metropolis in Oyo State. The ducks on Farm A were reared with indigenous chickens and geese on free range system while those on Farm B were reared on a semi-intensive system within a perimeter fence that was used to separate them from the commercial poultry flocks on the farm. The ducks obtained from backyard flocks were on free range, scavenging for themselves but occasionally fed with household leftovers.

Sample collection: A total of 126 blood samples were collected from apparently healthy, non-vaccinated, mostly adult indigenous domestic ducks from the three locations as follows: 15 samples from Farm A, 30 samples from Farm B and 81 samples from the backyard flocks. About 3-5 mL of blood was collected from each bird by jugular venipuncture. Samples were allowed to clot and then left for about 4 h at 4°C to allow for serum separation. Harvested sera were stored in Bijou bottles at -20°C until tested.

Agar Gel Precipitin Test (AGPT): Test sera were screened for IBDV precipitins using the Agar Gel Precipitin Test (AGPT) as described (Durojaiye *et al*., 1985). Briefly, 5 mm wells were made in 1% Oxoid agar gels in 5 cm diameter Petri dishes. A 1:3 (w/v) suspension of the virus prepared in phosphate-buffered saline in a manual tissue homogenizer using bursa of Fabricius from confirmed field outbreak of IBD and centrifuged at 2000 rpm for 10 min, served as the source of IBD antigen. The positive control serum was known IBD antiserum derived from chickens that had been hyperimmunised with successive intramuscular doses of IBD vaccine virus while the negative control was sera from unimmunised chickens reared separately, which were negative for IBDV precipitins. Test results were read after 18-24 h and finally read by 72 h.

RESULTS AND DISCUSSION

Out of the 126 sera tested for IBDV precipitins, only 24 (19.1%) were positive. None of the 15 samples from Farm A was positive but precipitin lines were obtained within 24-48 h in 9 (30.0%) out of the 30 samples collected from Farm B while 15 (18.5%) of the 81 samples collected from Ibadan metropolis were positive (Table 1). The positive controls showed precipitin lines within 24 h while the negative controls were negative. The Geometric Mean Titres (GMT) for the Farm B and indigenous duck samples were 21 and 23, respectively.

The result obtained in this study is not consistent with the reports of non-production of precipitins against protein antigen (Toth and Norcross, 1981) and that of non-detection of IBDV antibodies in the sera of 3-6 week old indigenous Nigerian ducks following experimental infection with IBDV (Tsai *et al*., 1986). This suggests that adult indigenous Nigerian domestic ducks are susceptible to IBDV infection. Yamada *et al.* (1982) detected IBDV precipitins in Pekin ducks infected at 180 days but could not isolate the virus from the ducks while those infected at 30 days did not produce precipitins. While McFerran *et al.* (1980) and Karunakaran *et al.* (1992) isolated IBDV from the faeces of healthy adult ducks and from the bursae of 5-16 day old ducklings, respectively, IBDV antibodies were detected in the sera of adult Eider ducks (Hollmen *et al*., 2000) and in 5 week old ducklings (Oladele, 2003). Considering the fact that most of the ducks used in the present study were more than 365 days old, coupled with the reports of previous workers (McFerran *et al*., 1980; Yamada *et al*., 1982; Karunakaran *et al*., 1992; Hollmen *et al*., 2000; Oladele, 2003), it is obvious that ducks of all ages are susceptible to IBDV infection. It has been reported (Kauper and Weiss, 1980) that an abundance of susceptible cells is necessary for the establishment of clinical IBD and the bursa of Fabricius has been shown (Nakai and Hirai, 1981; Cho *et al*., 1987) to contain high levels of susceptible B-lymphocytes. The fact that these IBDV infections of ducks do not progress to clinical disease could be due to the fact that ducks probably possess low levels of susceptible B-lymphocytes. Moreover, it seems possible that some breeds of ducks are more susceptible to IBDV infection than others. In Nigeria, the indiscriminate and uncontrolled mating among the indigenous duck population may have led, over the years, to the selection of individuals whose genetic make-up confers some level of resistance to IBD. The pathogenicity of the infecting IBDV strain and the virus dose may also contribute to the selective susceptibility of these ducks to IBDV infection.

The detection of precipitin lines in this study indicates the presence of antibodies against IBDV in indigenous Nigerian ducks. Since the birds were not vaccinated, this finding suggests that they were exposed to the virus at some point and subsequently seroconverted. This is of considerable epidemiological significance as it suggests that indigenous domestic ducks have an important role in the natural history of IBD and could serve as carriers of the virus, thereby complicating IBD control measures. The source of the infection in these ducks is most likely the domestic chickens with which they were reared in close association.

Table 1: Serologic survey of antibodies to IBD in indigenous Nigerian ducks

Location	Number positive/ Number sampled	Percentage positive (%)	Antibody titres of positive samples 2	4	8	16	32	64	128	*GMT
Farm A	0/15	0	-	-	-	-	-	-	-	-
Farm B	9/30	30	-	-	-	6	2	1	-	21
Backyard flocks	15/81	18.5	-	-	-	9	4	2	-	23
Total	24/126	19.1	-	-	-	15	6	3	-	

*GMT = Geometric Mean Titre

Serological studies, preferably on a national scale, to determine the role and age of indigenous Nigerian ducks in the epidemiology of IBD in Nigeria, attempts at isolating the virus from them and determination of the serotype involved are noted for further investigation.

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