Prevalence of Newcastle Disease Viruses in Wild and Captive Birds in Central Nigeria

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Abstract: Newcastle disease (ND) is an acute rapidly spreading, contagious, nervous and respiratory disease of domestic and wild birds caused by the Avian Paramyxovirus 1, the Newcastle disease (ND) virus. ND is endemic in Nigeria. The reservoir status of wild and captive birds for ND virus in central Nigeria is assessed in this study. Cloacal swabs were taken from one hundred and sixty three birds caught from five Local Government Council areas of Plateau, Benue and Kaduna States in central Nigeria. A total of thirteen ND Viruses were isolated from the three States. Viz: 8 isolates from Plateau, 4 from Benue and 1 from Kaduna State. One hundred and fifty three of the birds sampled belonged to 30 avian species in 10 Orders while ten birds were unidentified. Only 7% of the species in three Orders yielded ND viruses. The 13 isolates were characterized using the Mean death time of the Minimum lethal dose (MTD/MLD); Intracerebral Pathogenicity index (ICPI) Intravenous Pathogenicity index (IVPI) and the Reverse transcriptase polymerase chain reaction (RT/PCR). The results show that 12 of the isolates were of the lento genic strain while 1 isolate belonged to the Merogenic strain. The implication of these findings on the poultry industry in the country is discussed.

Key words: Newcastle disease, status, birds and wild

INTRODUCTION

Poultry production in Nigeria has witnessed a rapid growth in the last decade as a commercial enterprise involving hundreds of thousands of birds. This increase in the production activity is greatly pronounced on the Jos plateau in the central region of the country. It has given rise to new challenges especially that of diseases control (Hassan et al., 2006).

Newcastle disease (ND) poses a serious threat as it has economic and ecological impact on pet, free-living, as well as domestic birds. An average of 200-250 outbreaks of the disease is reported in Nigeria annually (Okeke and Lamorde, 1988). The virus strains prevalent in nature are highly virulent (velogenic) and are kept in circulation by vast populations of wandering local chickens, apparently normal ducks and free-flying birds (Nawath et al., 1975; Adu et al., 1985; Ibu et al., 2000). The isolation of velogenic viscerotropic ND virus from wild birds during ND outbreaks in poultry has led to the suggestion that wild birds could be important vehicles for the spread of the disease in the country (Haruna et al., 1993; Echeonwu et al., 1998). However, reports of ND virus isolations in epizootiological surveys of wild birds in Nigeria are scanty. The role of these birds in the maintenance of the disease in localities is therefore obscure. Such information is necessary for strategic planning for ND control in the country (Nawath, 1988). In this study, a survey of ND viruses was conducted on wild birds obtained from three states in central Nigeria to determine their carrier status.

MATERIALS AND METHODS

Sample collection and viral isolation: A total of one hundred and sixty three (163) apparently healthy wild and captive birds were caught at random from Vom, Miango, Museum, Kasuwan Kaje localities in Jos North and Jos South Local Government Council Areas (LGAS) of Plateau state; Wurukun, Udei and Guma localities in Makurdi and Guma LGAS of Benue state and Gwantsu, Fadan Karshe, and Ungwar Mallafia localities of Sanga LGA of Kaduna state, all in central Nigeria. Cloacal swabs coated with feces were collected from the birds unto a transport medium containing antibiotics. After sample processing, 0.2ml volumes of the supernatant fluid were used to inoculate 9-11 day-old embryonated chicken eggs (Hanson, 1980). Following primary isolation, the infective allantoic fluid was passed three times in eggs prior to serological identification.

Virus identification and Characterization: The virus isolates were identified using a standard Haemagglutination Inhibition (HI) test (OIE, 2004). The Newcastle disease virus Lasota freshly harvested, processed and stabilized in glycerin was used as positive control antigen. The ND hyperimmune serum
Table 1: Strains of ND Virus isolates obtained from free-living birds

<table>
<thead>
<tr>
<th>Isolate No</th>
<th>HA titre</th>
<th>EID50</th>
<th>Mdt</th>
<th>ICPI</th>
<th>ICPI</th>
<th>PCR</th>
<th>Strain</th>
</tr>
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<tr>
<td>R036</td>
<td>256</td>
<td>8.5</td>
<td>68.43</td>
<td>1.25</td>
<td>1.6</td>
<td>Aminherent</td>
<td>Merogenic</td>
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<td>R039</td>
<td>256</td>
<td>7.93</td>
<td>63.96</td>
<td>0.10</td>
<td>0</td>
<td>Aminherent</td>
<td>Lento genic</td>
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<tr>
<td>R032</td>
<td>256</td>
<td>7.75</td>
<td>64</td>
<td>0.3</td>
<td>0</td>
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<td>Lento genic</td>
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<tr>
<td>EN7</td>
<td>64</td>
<td>5.93</td>
<td>64.23</td>
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<td>Lento genic</td>
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<tr>
<td>J13</td>
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<td>5.33</td>
<td>68.56</td>
<td>0.42</td>
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<td>KD4</td>
<td>128</td>
<td>5.17</td>
<td>62.68</td>
<td>0.28</td>
<td>0</td>
<td>Aminherent</td>
<td>Lento genic</td>
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<tr>
<td>EN2</td>
<td>256</td>
<td>6.2</td>
<td>65</td>
<td>0.00</td>
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<td>EN11</td>
<td>256</td>
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<td>103</td>
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<tr>
<td>Jk2</td>
<td>64</td>
<td>7.5</td>
<td>60.3</td>
<td>0.20</td>
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<td>Lento genic</td>
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<tr>
<td>EN8</td>
<td>512</td>
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<td>91</td>
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<td>Lento genic</td>
</tr>
<tr>
<td>Jk4</td>
<td>128</td>
<td>5.75</td>
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<td>P016</td>
<td>7.75</td>
<td>0.99</td>
<td></td>
<td></td>
<td></td>
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<td>Lento genic</td>
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</tbody>
</table>

Fig. 1: PCR products of characterized virus isolates.

Fig. 2: Owl.

control was prepared locally from the same vaccine strain.

The assessment of virus virulence was based on the results of the Mean death time (MDT), Intracerebral pathogenicity index (ICPI), the Intravenous pathogenicity index (IVPI) and the Triple One – Step Reverse transcriptase / Polymerase chain reaction (RT-PCR) (Creels et al., 2002; OIE, 2004).

RESULTS

From one hundred and sixty three wild and captive birds sampled, thirteen (13) Newcastle disease virus isolates were obtained. Twelve of the viruses were of the Lento genic strain while one isolate belonged to the Merogenic strain (Table 1, Plates 1-5). The thirteen (13) ND viruses were isolated from seven (7) of the 30 different species of birds sampled (Table 2). The seven species belonged to four different orders (Table 3). Four of the ND virus isolates were each obtained from birds captured in Jos South and Jos North Local Government Council Areas (LGAS) of Plateau State, three from Guma LGAs of Benue State, one from Makurdi LGAs of the same state while one isolate was obtained from Sanga LGAs of Kaduna state (Table 4).

DISCUSSION

Newcastle disease (ND) is enzootic in Nigeria. The disease is widespread among village and exotic chickens (Fatumbi and Adene, 1979; Ezeokoli et al., 1984, Gomwalk et al., 1985; Abdu et al., 2004). The isolation of non-velogenic ND virus strains in this survey is an indication that mild strains of the virus are prevalent among wild birds in the sampled area. The sources of these mild strains in the wild are unknown. However, unregulated immunization of exotic chickens with live lento genic and merogenic vaccines is common (Ibu et al., 2002; Ibrahim et al., 2005b). The absence of a velogenic strain in this survey is at variance with the commonly held view that wild birds are carriers of the virulent ND viruses and may play a major role in the maintenance of the disease in domestic poultry (Majiyagbe and Nawathe, 1981, Haruna et al., 1993). However, the recent revelation that the highly virulent strains could evolve from viruses of low virulence by mutation (Alexander et al., 1997; Gould et al., 2001) underscores the significance of the findings in the present study. There is therefore the need to determine the nucleic acid sequences of these mild strains and their sequences compared with those of the existing velogenic strains from Nigeria to establish evolutionary relationships.
The thirteen ND viruses were isolated from nine species of birds belonging to three different orders. Newcastle disease virus is widely known to maintain a broad host range among the avian species (Kaleta and Baldauf, 1983). The latter group reported the detection of ND virus antibodies in 16 species of birds in Nigeria. The 7.8% virus isolation rate obtained here appears to be higher than the 3.2% reported by other workers in similar surveys elsewhere (Tumova et al., 1982).
Fig. 5: Pigeon

The presence of mild strains of the virus in localities could be responsible for the variability in the responses of village poultry to sporadic outbreaks of ND in the country. It could also be responsible for vaccine failures commonly observed in commercial flocks (Ugochukwu, 1982; Nawathe, 1985). The village chickens which outnumber commercial poultry by 8 to 1 in Nigeria are frequently seen roaming side by side with wild birds scavenging for food in the localities (Adene, 2004). Most workers in commercial poultry farms seem to hail from households where free-range chickens are kept. Therefore there is a direct linkage between wild birds and the village poultry on the one hand and between village poultry and the commercial farms via the personnel on the other.

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