A natural outbreak of Newcastle disease in guinea-fowl (Numida meleagris galeata) in Nigeria

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Summary: A natural outbreak of Newcastle disease (ND) was reported in a flock of guinea-fowl in Nigeria, affecting 1,029 birds of which 250 (24.3%) died. Paralysis of the legs and wings, coughing, sneezing, white diarrhoea and complete cessation of egg production were observed.

Serum samples collected at the onset and during the course of the disease had high ND antibody titres. ND virus was isolated from a pool of brain tissues from diseased guinea-fowl. The ND virus isolate was characterised as a velogenic strain.


INTRODUCTION

The guinea-fowl (Numida meleagris galeata, Pallas) is a common indigenous bird on the African continent. In the northern part of Nigeria, these birds are kept in every village and are abundant in the wild. There are approximately 44 million guinea-fowl in captivity in the country (4) and the products from these birds are well accepted socially (5). However, the level of production is low compared to chickens. This is attributed to poor husbandry practices and the occurrence of disease (5, 8, 15). Such disease problems are increasingly being observed in birds kept under intensive management systems.

This paper reports on an outbreak of Newcastle disease (ND) in a flock of guinea-fowl at the National Veterinary Research Institute Poultry Farm in Vom, Nigeria, and the isolation and characterisation of ND virus (NDV) from a pool of brain tissues of the infected birds.

MATERIALS AND METHODS

The National Veterinary Research Institute Poultry Farm is located in Vom, Nigeria (11). A total of 20,000 chickens of various ages were housed on the farm, together with 445 and 584 guinea-fowl aged twelve weeks and thirty weeks, respectively. The guinea-fowl were kept in two blocks of houses which were each divided into five compartments.
by concrete walls. The younger flock occupied two compartments of the first block, while the adults were kept in three compartments of the second block.

Guinea-fowl have been kept on this farm for more than ten years (14) without problems, except for a few coccidial outbreaks. Records also indicate that there was an outbreak of ND in a flock of chickens approximately six years previously. Since then, routine vaccination of the chickens against ND and other viral and bacterial diseases has been performed. No vaccinations are performed on guinea-fowl.

Laboratory examination

A total of 100 guinea-fowl were bled by jugular venepuncture at the onset of the disease, and a further 200 were bled two weeks later. The sera were separated, inactivated at 50°C for 30 min and stored at -20°C until testing.

Dead birds were subjected to post-mortem examination. Samples were then taken for virological, bacteriological and parasitological examination.

Suspensions of pooled brain tissues were prepared in sterile phosphate-buffered saline (PBS) containing antibiotics and inoculated into ten-day-old embryonated chicken eggs (10). After the primary isolation, the virus was passaged three times before serological identification was attempted, using the haemagglutination inhibition (HI) technique (1). The source of known haemagglutinin was NDV La Sota strain, while the control positive and negative sera were prepared locally, on the basis of previous tests.

This virus was characterised using standard methods (2, 3). NDV strains Herts 33/56, Komarov, La Sota and intraocular vaccine were used as standard controls.

RESULTS

Clinical disease

The disease was first observed in the younger flock with signs of dullness, ruffled feathers, greenish-white diarrhoea, coughing and sneezing, paralysis of the legs and wings, and paddling movement of the legs in some birds. The disease spread to the adult flock three weeks later, resulting in a drastic decrease in egg production with complete cessation for two to three days (Fig. 1).

A total of 130 (29.21%) of the younger and 120 (20.20%) of the adult birds died during the course of the disease.

Lesions observed on post-mortem examination included ecchymotic haemorrhages on the tracheal mucosa, congested lungs and caecal tonsils, catarrhal enteritis, and slight enlargement and congestion of the liver and spleen.

Parasitological and bacterial examination

No parasites were observed on examination of the intestinal contents. However, *Escherichia coli* was isolated from some of the carcasses.

Serology

Of the sera collected at the onset of the disease, 85% were positive for ND antibodies, with titres ranging from log$_2$ 5.0 to log$_2$ 10.0. At the second bleeding, all serum samples were positive for ND antibodies, with titres ranging from log$_2$ 6.0 to log$_2$ 11.0.
Daily egg production during the course of an outbreak of Newcastle disease in guinea-fowl in Nigeria

The birds were housed in three different compartments (a, b and c)

Isolation, identification and characterisation of the virus

Harvested allantoic fluid of the primary isolate showed very weak haemagglutination activity with chicken red blood cells. At the third passage level, the haemagglutinating properties of the isolate became very prominent, with haemagglutination activity of $\log_2 6.0$, compared to $\log_2 9.0$ given by NDV La Sota.
The haemagglutination activity of the isolate was inhibited by a known NDV antiserum giving a mean haemagglutination inhibition (HI) titre of $\log_2 7.0$, while the same serum showed inhibition activity on NDV La Sota with a HI titre of $\log_2 7.5$.

This virus was characterised as a velogenic strain on the basis of the test conducted. Details of the characterisation indices (compared to some reference virus strains) are given in Table I.

**DISCUSSION**

Studies have shown that guinea-fowl are affected by most of the common diseases of chickens, especially when kept under intensive management (8, 9, 15). ND is known as a devastating disease in domestic chickens, which has recently been observed in guinea-fowl in Nigeria (7, 16).

**Table I**

*Characterisation of Newcastle disease virus (NDV) isolates from guinea-fowl*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>NDV guinea-fowl</th>
<th>Herts 33/56</th>
<th>Strains Komarov</th>
<th>La Sota</th>
<th>Intraocular vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemagglutination (HA) titre (geometric mean)</td>
<td>64</td>
<td>64</td>
<td>256</td>
<td>512</td>
<td>128</td>
</tr>
<tr>
<td>50% egg infective dose ($\log_{10}$)</td>
<td>8.36</td>
<td>10.50</td>
<td>8.35</td>
<td>8.38</td>
<td>8.17</td>
</tr>
<tr>
<td>Mean death time (hours post-infection)</td>
<td>48.8</td>
<td>51.8</td>
<td>73.5</td>
<td>71.12</td>
<td>71.12</td>
</tr>
<tr>
<td>Minimum lethal dose ($\log_{10}$)</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Intracerebral pathogenicity index</td>
<td>1.69</td>
<td>1.66</td>
<td>0.81</td>
<td>0.29</td>
<td>0.11</td>
</tr>
<tr>
<td>Intravenous pathogenicity index</td>
<td>2.10</td>
<td>1.76</td>
<td>0.42</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>HA adsorption by brain cells (%)</td>
<td>95.31</td>
<td>96.88</td>
<td>81.25</td>
<td>25.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Thermostability of haemagglutinin (min)</td>
<td>120</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>Rate of elution</td>
<td>fast</td>
<td>fast</td>
<td>fast</td>
<td>slow</td>
<td>slow</td>
</tr>
<tr>
<td>Haemagglutination of mammalian erythrocytes (geometric mean titre)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equine</td>
<td>0</td>
<td>0</td>
<td>32</td>
<td>128</td>
<td>256</td>
</tr>
<tr>
<td>Bovine</td>
<td>32</td>
<td>0</td>
<td>32</td>
<td>256</td>
<td>512</td>
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<tr>
<td>Goat</td>
<td>0</td>
<td>0</td>
<td>32</td>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>Sheep</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1,024</td>
<td>1,024</td>
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<tr>
<td>Rabbit</td>
<td>0</td>
<td>0</td>
<td>64</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Swine</td>
<td>0</td>
<td>2</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Human</td>
<td>32</td>
<td>8</td>
<td>64</td>
<td>128</td>
<td>128</td>
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<tr>
<td>Chicken (control)</td>
<td>64</td>
<td>64</td>
<td>256</td>
<td>512</td>
<td>128</td>
</tr>
</tbody>
</table>

Strain type

velogenic  velogenic  mesogenic  lentogenic  lentogenic
During this outbreak, the signs observed were similar to those described by Bennejean and colleagues (6), except that the respiratory symptoms were more prominent. Egg production ceased completely for two to three days (Fig. 1) as has been reported in chickens (9). However, the mortality rate of the younger and adult birds was low (29.21% and 20.20%, respectively) compared to 50% and 70%, respectively, reported by Lage and colleagues (12), although it was similar to the rate observed by Okaeme and colleagues (16).

The NDV strain isolated was characterised as a velogenic strain, with very high virulence and a short “mean death time” of 48.8 h (Table I). The properties of this virus are similar to those of the Herts 33/56 strain and some strains previously isolated in chickens in Nigeria (13).

This outbreak is likely to have originated from scavenging birds which perch in large numbers on the eucalyptus trees planted very close to the block housing the younger guinea-fowl. These birds are often seen picking fallen feed at the entrances of the compartments. Spread of the disease to the adults was facilitated by the poultry attendants in charge of these birds.

With the growing demand for animal protein, there is an increasing amount of guinea-fowl production in Nigeria. These birds are most often kept side by side with chickens, thus exposing them to similar diseases. Therefore, there is a need to incorporate guinea-fowl in all vaccination programmes involving chickens, in order to reduce the risk.

ACKNOWLEDGEMENTS

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Résumé : Une épidémie naturelle de maladie de Newcastle a été observée dans un élevage de pintades au Nigeria ; sur 1 029 volailles atteintes, 250 (24,3 %) sont mortes. Les signes cliniques étaient les suivants : paralysie des pattes et des ailes, toux, éternuements, diarrhée blanche et interruption totale de la ponte.

Les sérums prélevés dès les premières phases et pendant le déroulement de la maladie, présentaient des titres élevés d’anticorps de la maladie de Newcastle. Le virus de Newcastle a été isolé à partir d’un mélange d’encéphales de pintades malades. La souche isolée était de type velogène.


**Resumen:** Se comprobó un brote natural de la enfermedad de Newcastle en una cría de pintadas en Nigeria. De los 1.029 animales afectados, 250 murieron (24,3%). Los signos clínicos eran los siguientes: parálisis de patas y alas, tos, estornudos, diarrea blanca e interrupción total de la puesta.

Los sueros extraídos desde las primeras fases y durante el desarrollo de la enfermedad presentaban títulos diversos de anticuerpos de la enfermedad de Newcastle. El virus de Newcastle pudo ser aislado a partir de una mezcla de encéfalos de pintadas enfermas. La cepa aislada era de tipo velogénico.

**PALABRAS CLAVE:** Aislamiento del virus – Enfermedad de Newcastle – Nigeria – Pintadas – Tipaje del virus.

**REFERENCES**


