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## Infectious bursal disease in commercial birds and circulating antibodies in rural chickens in Jos South, Plateau State, Nigeria

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### Abstract

Infectious Bursal Disease (IBD) is a highly contagious immunosuppressive disease of young chickens that constitutes a continuous scourge to the success of poultry production in Nigeria despite the availability of effective vaccines. Here, an outbreak of IBD in a small-scale commercial flock with high mortality is reported. Postmortem examination revealed haemorrhages on the thigh muscles and an inflamed bursa of Fabricius. Tissue samples were collected from the farm, and sera from free roaming chickens within the neighbouring villages in Jos south LGA, Plateau State. A total of 250 sera were collected from local birds within the five districts of the LGA using a random sampling method. The samples were analyzed using Agar Gel Immunodiffusion assay for the detection of antigen and serum antibodies against the IBD virus (IBDV). Results confirmed the presence of IBD antigen in the commercial poultry and high serological evidence of IBDV among local chickens in Jos South LGA, with a 78% average prevalence rate across the 5 districts assayed. The highest was observed in Zawan (88%), while the least was in Du (72%). These findings confirmed the level of exposure and endemicity of IBD in the sampled population. Detection of high levels of antibodies against IBDV in the studied population is an indication of natural infection among the local chickens as they are generally not routinely vaccinated against the disease. Thus, they may serve as reservoirs and a possible source of IBDV transmission to commercial poultry. Therefore, any effort towards controlling IBD should consider vaccinating rural chickens to prevent them from being reservoirs of the virus.

**Keywords:** Antigen/Antibodies, Infectious Bursal Disease, Nigeria, Plateau State, Rural poultry

## Introduction

Infectious bursal disease (IBD) presents extensive economic and welfare problems in poultry farms throughout the world. The disease affects lymphatic tissues like the bursa of Fabricius and the spleen, resulting in lymphoid depletion in the bursa of Fabricius (Getachew & Fesseha, 2020). It was first reported in Nigeria in the early 70s (Ojo *et al.*, 1973) and has since become endemic (Mai *et al.*, 2004; Oluwayelu *et al.*, 2007). Acute IBD is often seen in 3–6-week-old birds, a less acute or subclinical disease is common in younger birds, up to 3-week-old. IBD is characterized by very high morbidity with severe depression in affected flocks lasting for 5–7 days. Mortality rises abruptly for 2 days then recedes over 2–3 days after the peak. The mortality can reach 30–40% of the infected flock. Clinical signs include watery diarrhoea, ruffled feathers, reluctance to move, anorexia, trembling and prostration. Dehydration of the muscles with haemorrhages, enlargement and discolouration of the kidneys are seen at post mortem. The bursa of Fabricius often shows the main characteristic post mortem lesions, such as hypertrophy and turgidity with a pale-yellow discoloration, or may be completely haemorrhagic giving the appearance of a black cherry (Orakpoghenor *et al.*, 2020)

Commercial poultry breeders are the most affected, as IBD leads to a drastic decrease in productivity and, subsequently, economic losses. In rural poultry, the farm cycle consists of village chickens that have frequent exposure to the disease. To understand the challenge of IBD prevalence in commercial birds, the immune status of free-ranging rural chickens was investigated due to their close interaction with rural livelihoods, low vaccination levels, and potential as a source of re-infection (Henning *et al.*, 2007; Sati *et al.*, 2024). Commercial poultry are routinely vaccinated while rural chickens are not. The presence of antibodies to IBD in rural chickens mostly signifies exposure to the virus. Antibodies to IBDV can be influenced by breed, management practices, vaccination sources, and cumulative attention of rural chickens. This report presents an IBD outbreak in a commercial flock and serological evidence of exposure of rural chickens in the community, where the case was reported from, and its implications on sustained and periodic outbreaks.

## Case Presentation

### History

A suspected case of IBD was reported to the Diagnostic Laboratory, NVRI, Vom, Plateau State,

Nigeria, in a 5-week-old Isa Brown pullets farm with a flock size of 500 birds. The birds were reportedly obtained at day old, from a commercial hatchery and were being kept on a deep litter management system. As part of the routine vaccination regimen, the farmer administered IBD and ND (Lasota) vaccines in drinking water at 2-week-old, one day apart. The second doses of the vaccines were administered combined in drinking water, at 4-week-old. There was no history of pre- or post-vaccination monitoring.

The outbreak was reported to have started exactly one week after the second vaccination, and the farmer reported the case two days after the onset of clinical signs. The signs observed by the farmer included ruffled feathers, huddling together, and death (Plate I).

At the time of the visit, the farm had lost over 100 birds, and only 360 birds were remaining out of the 500 in the pen. The mortality pattern exhibited over the course of the IBD outbreak is represented pictorially in Figure 1. Postmortem examination revealed haemorrhages on the thigh muscles, and inflamed bursae of Fabricius (BF). The bursae were collected for laboratory diagnosis. As part of the investigation, the environment was investigated, and rural chickens within the community where the farm was sited were sampled and screened for antibodies against IBD.

### Investigation

Sampling and postmortem analysis: Bird carcasses were collected and processed at the Pathology Department of the Central Diagnostic Laboratory, National Veterinary Research Institute (NVRI), Vom, for disease investigation and laboratory diagnosis. Postmortem examination of the birds revealed atrophied pectoral muscle (Plate IIa), haemorrhages on the thigh muscles (Plate IIb) and enlarged bursa of Fabricius (BF) (Plate IIc).

The bursae samples were collected and submitted to the Avian Virology Laboratory of NVRI. Local/rural chickens found on the farm and the surrounding neighbourhood were sampled (blood/serum) for their possible role in the outbreak. Subsequently, rural chickens from four more villages where commercial birds are kept were randomly sampled. A total of 250 sera were collected and tested to elucidate the role of this category of birds in disease maintenance and dissemination.

Laboratory diagnosis: The Bursa of Fabricius and sera collected were tested for the presence of IBDV antigen and antibody, respectively, using the Agar gel immunodiffusion test (AGID) according to standard protocol by the World Organization for Animal Health.

Results confirmed the presence of IBDV antigen in the tested bursal specimens, by showing line of identity to the IBDV positive antiserum. Similarly, the presence of IBDV antibodies was confirmed in some of the sera that were collected from rural chickens across Jos South LGA. The sera samples showed an average of 78% positivity for antibodies to the virus (Table 1).

**Case management**

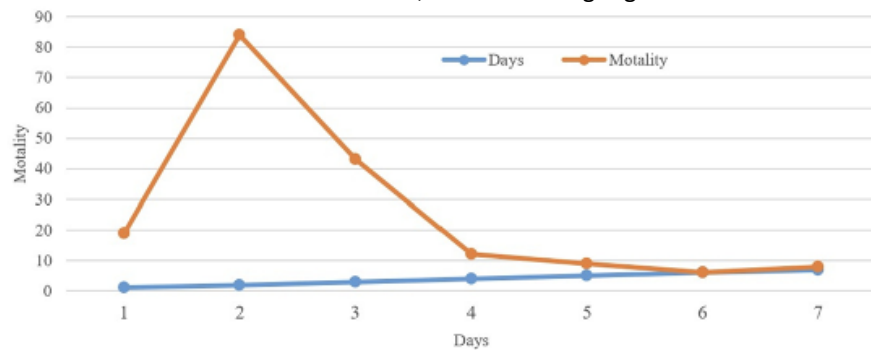
IBD is a viral disease with no known treatment, although vaccine preventable. Thus, the farmer was advised to disinfect the farm with a virucidal solution containing 55mg/100 ml iodine and give supportive therapy to the remaining birds. For disease prevention, the farmer was further advised to improve general hygiene and maintain strict biosecurity measures in and around the farm; engage the services of a veterinarian and also, to keep rural free roaming chickens away from the farm as much as practicable.

**Discussion**

Infectious bursal disease is endemic in Nigeria and remains a major source of concern to poultry farmers despite the availability and use of effective vaccines.



**Plate I:** Clinical signs associated with the suspected case of IBD in 5-week-old commercial chickens. a)ruffled feathers; b)birds huddling together



**Figure 1:** Mortality pattern observed in a 5-week-old pullet flock with suspected case of IBD (Note the “SPIKE” and the sharp decline in mortality from days 2 to 4)



**Plate II:** Gross lesions observed at postmortem examination of birds with suspected IBD. <sup>a</sup>haemorrhages on thigh muscle; <sup>b</sup>atrophied pectoral muscle; <sup>c</sup>inflamed bursa of Fabricius in 5-week-old pullets

This is evidenced in the case reported where the birds were reportedly vaccinated, yet came down with the disease. This suggests a probable case of vaccine failure, which could arise from various factors, such

**Table 1:** Serological prevalence of Infectious Bursal Disease among rural chickens sampled across the five districts of Jos South

District	No. of Samples	No. Positive	Percentage (%)
Vwang	50	37	74
Kuru	50	38	76
Gyel	50	39	78
Du	50	36	72
Zawan	50	44	88
Total	250	194	78

as poor vaccine handling, vaccine mismatch, presence of maternally derived antibody (MDA) at the time of vaccination or failure of the vaccines to elicit protective immunity in the vaccinated flock. This indicates the need for the development of a vaccination management protocol for effective control of IBD, including vaccination timing *vis-à-vis* monitoring maternally derived antibodies in susceptible flocks as well as post-vaccination seromonitoring. MDA against IBVDV has been reported to have negative interference with vaccination either by direct neutralization of vaccine virus or suppression of antibody production in the young bird (Orakpoghenor *et al.*, 2023). Furthermore, the mortality pattern observed in this case was typical of IBD being self-limiting. There was sudden onset of mortality which rose abruptly for 2 days then receded over the next 2–3 days after the peak. The mortality recorded in this case was well over 30% of the initial population which underscores the devastation of IBD in fully susceptible flocks.

There are a few studies on the presence of antibodies to IBD virus in free-roaming rural chickens around commercial poultry. Clinically, IBD has been described in commercial poultry in Nigeria. However, detection of antibodies against IBVDV in this category of birds is an indication of natural infection among the local chickens, as they are generally not routinely vaccinated against the disease as reported by Kulikova *et al.* (2004). The observed high prevalence (78%) of IBVDV antibodies suggests the possible role of free-roaming rural chickens in the maintenance and spread of the virus in the environment. They may serve as disease reservoirs and a possible source of transmission to commercial poultry. Therefore, efforts towards effective disease control of IBD should consider vaccinating rural chickens to prevent them from being reservoirs of the virus.

Rural chickens are thought to be hardy and resistant to several infections, which perhaps maybe due to underreporting. However, their presence around commercial farms may constitute a persistent risk of infection (Henning *et al.*, 2007). Previous studies on

IBD and other diseases such as coccidiosis to which the rural chickens are constantly exposed to have been linked to outbreaks in commercial production (Oluigbo & Enurah, 1989).

Farm management practices have also been associated with either positive or negative outcomes on farms. We observed that farms or farming communities have chickens that are allowed to roam freely, sometimes in and out of commercial farms and that poses a challenge to disease prevention and control. Besides improper handling and administration of vaccines, farm management needs to be improved. Pre- and post-vaccination seromonitoring is also critical for an effective vaccination programme.

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#### Conflict of Interest

The authors declare that there is no conflict of interest.

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