FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 11 No. 3, September 2025: Pp. 64-68

https://doi.org/10.33003/jaat.2025.1103.07

INFECTIOUS BRONCHITIS IN A 30-WEEK-OLD BROILER BREEDER FLOCK (ARBOR ACRE PARENT STOCK): A CASE REPORT

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ABSTRACT

Infectious bronchitis (IB), caused by the avian gammacoronavirus Infectious Bronchitis Virus (IBV), is a highly contagious poultry disease that causes significant economic losses globally. This report describes an outbreak in a 30-week-old Arbor Acre parent stock breeder flock of 1,250 birds in Oyo State, Nigeria. Clinical signs included a sharp decline in egg production, misshapen and rough-shelled eggs, reduced feed intake, diarrhea, and increased mortality, mainly in females. Post-mortem findings were tracheal catarrh, ovarian follicle degeneration, bluish combs and wattles, and watery albumen. Bacterial culture confirmed *Escherichia coli* as a complicating infection, showing multidrug resistance but susceptibility to gentamicin. Serological testing demonstrated high IBV titres above the protective range with a narrow coefficient of variation, indicating uniform exposure to a circulating field strain despite prior vaccination with the H120 strain. Supportive management, nutritional supplementation, and gentamicin therapy improved flock performance, with egg production rising from 64% to between 74% and 88%. This case illustrates the persistence of IBV in breeder flocks despite vaccination and the potential role of colibacillosis in worsening outcomes. It further underscores the importance of strict biosecurity, adoption of strain-specific or updated vaccination strategies, and supportive care in reducing losses linked to IB outbreaks in Nigeria and similar production settings.

Keywords: Infectious bronchitis virus, Arbor Acre, Breeder flock, Colibacillosis, Vaccine failure

INTRODUCTION

Infectious bronchitis (IB) is one of the most economically important viral diseases of chickens worldwide, caused by Infectious Bronchitis Virus (IBV), an avian gammacoronavirus (Cavanagh & Naqi, 2003; Jackwood). IBV affects the respiratory tract, kidneys, and reproductive system, leading to impaired growth, increased mortality, and substantial reductions in egg production and egg quality (Cook *et al*., 2012; Bande *et al*., 2016). In breeder flocks, IBV outbreaks are particularly devastating, resulting in decreased hatchability, increased numbers of "bangers," and inferior egg quality, all of which compromise flock productivity and profitability (de Wit *et al*., 2011; Brian, 2024).

The disease is acute and highly contagious, spreading rapidly through horizontal transmission via respiratory secretions, feces, and contaminated fomites (Jordan, 2017). Despite widespread use of live-attenuated and inactivated vaccines, IB outbreaks persist in commercial poultry due to the virus's high mutation rate and antigenic variability, which enable circulating field strains to escape vaccine-induced immunity (Valastro *et al*., 2016; Jackwood, 2017). In particular, the emergence of numerous serotypes and variants complicates effective vaccine matching, leaving flocks vulnerable even when vaccination protocols are followed (Lee *et al*., 2020).

This report documents an outbreak of IB in a vaccinated Arbor Acre broiler breeder flock in Nigeria. The clinical presentation, diagnostic findings, management interventions, and production outcomes are presented to highlight ongoing challenges of IBV control and the importance of improved strain-specific vaccination strategies and biosecurity in breeder operations

FLOCK HISTORY AND MANAGEMENT

A 30-week-old flock of 1,250 Arbor Acre broiler breeders reared on a deep-litter system in Oyo State, Nigeria, was investigated following reports of a decline in egg production and increased mortality. The birds were managed under standard biosecurity and fed breeder diets formulated to meet nutrient requirements. Vaccination records indicated the administration of infectious bronchitis vaccine (H120 strain) at days 5 and 21, with boosters at 6, 17, and 22 weeks of age, alongside other routine vaccinations for Newcastle disease, Gumboro disease, and fowl pox.

CLINICAL FINDINGS

Clinically, affected birds showed respiratory distress, reduced feed intake, ruffled feathers, and a marked decline in egg production. Some birds exhibited cyanosis of the comb and wattles, along with depression and mild coughing. Eggs collected from the flock were frequently small, pale, misshapen, or cracked, with poor shell quality and watery albumen (Fig. 1–5). Hatchery records confirmed reduced fertility and hatchability, with an increase in early embryonic deaths observed during egg breakout analysis. These hatchability losses were attributed primarily to reproductive tract involvement associated with infectious bronchitis virus

(IBV) infection, while suboptimal egg handling and incubation factors, such as prolonged storage, inadequate turning, and possible parental nutritional deficiencies, likely compounded the poor hatch results rather than serving as direct causes.

Post-mortem Examination
Representative dead and culled birds were subjected to necropsy, during which lesions of the respiratory tract, kidneys, and reproductive organs were documented, with emphasis on tracheal mucosa, ovarian follicles, and oviductal tissues. Post-mortem findings included bluish discoloration of the comb and wattles, mucous accumulation in the trachea, ovarian follicle degeneration, and watery albumen in freshly laid eggs (Fig. 4–5). These findings were consistent with reproductive involvement in infectious bronchitis. Bacteriological culture of tracheal, ovarian, and oviductal swabs yielded Escherichia coli, confirming a concurrent colibacillosis (Fig. 6).

LABORATORY INVESTIGATIONS

Bacteriology:
Swabs collected from the trachea, ovary, and oviduct were cultured on Eosin Methylene Blue (EMB) agar after overnight incubation at 37ºC. Isolates were identified using standard bacteriological techniques, and antimicrobial susceptibility testing was performed using the Kirby–Bauer disc diffusion method according to Clinical and Laboratory Standards Institute (CLSI, 2017) guidelines. *Escherichia coli* was isolated, confirming a concurrent colibacillosis (Fig. 6). The isolates exhibited resistance to ciprofloxacin, sulphamethoxazole, thiamphenicol, streptomycin, tetracycline, and amoxicillin but remained sensitive to gentamicin.

Serology:
Blood samples were collected and analyzed for Infectious Bronchitis Virus (IBV) antibodies using a commercial ELISA kit (IDEXX®, USA). The mean antibody titre exceeded the expected protective range of 15,000–28,000 for the most recent vaccination, while the coefficient of variation (%CV) was narrow, indicating a uniform antibody response across the flock. These findings, when correlated with the clinical and post-mortem observations, suggested field exposure to a circulating strain of IBV despite prior vaccination with the H120 strain.

Egg Breakout Analysis:
An egg breakout analysis was conducted to determine the causes of reduced fertility and hatchability. Eggs were examined for shell integrity, albumen quality, and embryonic death stages (early, mid, or late). The findings confirmed increased early embryonic deaths and poor albumen quality. Potential contributing factors such as storage conditions, inadequate egg turning during incubation, and parental nutritional deficiencies were considered.

DIFFERENTIAL AND TENTATIVE DIAGNOSIS

Based on the respiratory signs, reduced egg production, post-mortem lesions, and serological evidence, the tentative diagnosis was Infectious Bronchitis Virus (IBV) infection complicated by colibacillosis. Differential diagnoses included Newcastle disease , and egg drop syndrome; however, the serological profile and characteristic egg and reproductive lesions strongly supported infectious bronchitis as the primary cause.

TREATMENT, ADVICE TO CLIENT, AND OUTCOME

Following laboratory confirmation, the flock was treated with 25% Gentamicin soluble powder at a dosage of 100 g per 400 litres of water administered orally for seven consecutive days to control secondary bacterial infection. Supportive therapy with multivitamins and electrolytes was provided, and strict biosecurity measures were reinforced. To prevent recurrence and improve hatchability, the client was advised to store eggs at a temperature of 16–18°C with 75% relative humidity and to avoid storage for more than seven days before setting in order to maintain viability. Breeder hens were advised to receive adequate nutrition, particularly vitamins A, D, and E, along with other essential trace minerals to enhance reproductive performance and embryo viability. The importance of enhanced biosecurity practices was emphasized, including regular monitoring of breeder flocks for diseases that compromise embryo health, as well as thorough cleaning and disinfection of incubation equipment before egg setting. The maintenance of consistent temperature and humidity during setting and hatching was also recommended to reduce embryonic mortality. Following the implementation of these measures, the farm’s

conditions improved markedly. Hatchable egg production increased from 64% to fluctuating between 74% and 88%, despite the absence of specific antiviral treatment for infectious bronchitis. This improvement demonstrated that supportive management, optimal incubation conditions, and nutritional correction can significantly enhance recovery and production outcomes in breeder flocks affected by infectious bronchitis.

Fig. 1. A crate of eggs showing small, pale, and misshapen eggs.

Fig. 2. **Deformed and whitish-colored eggs.**

Fig. 3. Poor egg quality characterized by watery consistency of thick and thin albumen.

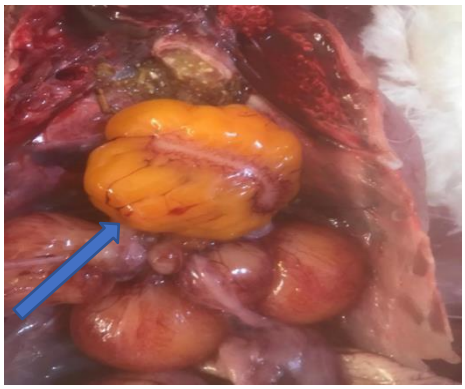

Fig. 4. Ovarian follicular degeneration in situ (blue arrow), associated with misshapen eggs.

Fig. 5. Cracked egg in a crate showing watery albumen.

Fig. 6. Effects of Infectious Bronchitis Virus and colibacillosis on progeny.

DISCUSSION

The clinical signs, reduced egg production, and poor egg quality observed in this flock are consistent with Infectious Bronchitis Virus (IBV) infection, a highly contagious respiratory and reproductive disease of poultry (Cavanagh, 2007; Cook *et al*., 2012). The presence of watery albumen and misshapen eggs has been well documented in field outbreaks of IBV, particularly when nephropathogenic or variant strains circulate among laying hens (OIE, 2019). The reduction in fertility and hatchability, together with increased embryonic deaths, further supports the significant impact of IBV on reproductive performance (de Wit *et al*., 2011). Serological findings confirmed exposure to IBV, with a mean titre above the expected protective range (15,000–28,000) and a narrow %CV, indicating uniform antibody response across the flock. This suggests recent exposure to a circulating field strain rather than inadequate vaccination. Similar serological patterns have been reported in cases of IBV where vaccination was not sufficient to prevent infection by heterologous strains (Jackwood, 2012; Bande et al., 2016). Nonetheless, possible factors such as improper vaccine handling, breaks in the cold chain, or uneven administration could have contributed to reduced vaccine efficacy. Although the vaccination schedule was appropriately followed, such lapses cannot be completely ruled out in field conditions.

Post-mortem findings of ovarian follicle degeneration, cystic oviducts, and watery albumen highlight the virus's tropism for the reproductive tract. These lesions are classical in layers affected by IBV, with permanent damage to the oviduct leading to chronic reduction in egg quality (Bijlenga *et al*., 2004). Concurrent isolation of *Escherichia coli* indicates secondary colibacillosis, which likely aggravated the respiratory distress and contributed to the severity of clinical signs. Such co-infections are common in IBV outbreaks, as the virus predisposes birds to opportunistic bacterial invasion (Nakamura *et al*., 1992; Landman & van Eck, 2017).

The hatchery breakout analysis pointed to early and mid-term embryonic deaths, which may have been exacerbated by poor egg storage practices and nutritional deficiencies. While IBV is the primary pathogen, improper egg handling and parental nutrition also compromise embryonic viability, making disease impact more severe (Molenaar *et al*., 2010).

Management interventions including improved biosecurity, ventilation, and supportive therapy with electrolytes and multivitamins helped stabilize the flock. The use of gentamicin controlled the concurrent colibacillosis, resulting in reduced mortality and gradual improvement in production, which increased from 64% to fluctuating between 74% and 88%. These findings underscore the importance of integrated management combining disease control, vaccination strategy, and hatchery best practices in mitigating the impact of IBV (Cook *et al*., 2012; de Wit *et al*., 2011).

CONCLUSION

This case highlights the significant economic and production losses associated with Infectious Bronchitis (IB) complicated by Escherichia coli infection in commercial layer flocks. The clinical, pathological, serological, and bacteriological findings underscore the importance of integrating routine diagnostic surveillance, vaccination, and strict biosecurity to prevent and control IB outbreaks. Concurrent colibacillosis aggravated the severity of the disease, emphasizing the role of secondary bacterial infections in increasing mortality and compromising egg quality and hatchability. Early and accurate diagnosis, coupled with appropriate intervention, remains critical in safeguarding flock health and productivity.

ACKNOWLEDGMENT

The authors sincerely thank the staff of the Avian Clinic, University of Ibadan Veterinary Teaching Hospital, for their technical assistance in sample collection and post-mortem examinations, as well as the diagnostic laboratory staff for their support in serology and bacteriology. Appreciation is also extended to the farm management for their cooperation throughout the investigation.

CONFLICT OF INTEREST

The authors declare no conflict of interest related to this study.

FUNDING

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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