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Case Report

Management of Colibacillosis, Newcastle Disease, and Ascaridiasis in A Flock of One-Year-Old Layer Chickens

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ABSTRACT

Poultry production, though a very lucrative venture, is being marred by diverse challenges, including infectious diseases. In the poultry industry, Newcastle disease (ND) is often complicated by *Escherichia coli* and *Ascaridia galli*. This case report described the diagnosis and management of these diseases in a flock of one-year-old Isa Brown layer chickens with complaints of increasing mortality and a decrease in egg production. The clinical case was diagnosed and treated based on the results of postmortem findings, and diagnostic work-up including pericarditis, congested and friable liver, misshapened and pedunculated ovarian follicles, necrotic caecal tonsils, egg yolk peritonitis, petechial haemorrhages on and erosion of proventricular mucosae, low protective antibody (26%), and identification of *Ascaridia galli* from the small intestine, and *E. coli* from sampled organs. The flock was treated with 20% Enrofloxacin at 1 mL/2 L + Povidone (10% iodine) at 1 mL/2 L, and 10% Mebendazole at 1 g/L, all in drinking water for five and two consecutive days, respectively. Ten days post-treatment, mortality rates plummeted, and egg production resumed its peak. These findings demonstrate that a combination of diagnostic work plans, such as postmortem examination, microbial culture, and antibiotic susceptibility testing, and the haemagglutination inhibition test, is reliable for diagnosis and management of natural concurrent infections associated with ND, colibacillosis, and ascaridiasis.

Keywords: Ascaridiasis; Colibacillosis; Laboratory diagnosis; Management; Newcastle disease; Poultry

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INTRODUCTION

Poultry plays a significant role in the human economy by providing food while generating wealth through job creation for our growing population (Alders *et al.*, 2019). According to Stiles (2017), poultry farming refers to the domestication of birds, such as chickens, ducks, quails, turkeys, and geese, with the intent of rearing them for meat, egg production, and utilising their incidental products, including faecal droppings and feathers, in industries as natural, unprocessed materials. Poultry keeping stands as an untapped resource that can generate employment for millions of Nigerian youths in rural and peri-urban areas as entrepreneurs, skilled, and unskilled workers (Ajala *et al.*, 2020). Poultry farming is essential to global food security, providing a significant source of protein through meat and eggs. However, maintaining a healthy flock is not without its challenges. If not managed effectively, poultry diseases negatively impact productivity, reduce flock health, and lead to substantial financial losses (Abalaka *et al*., 2017). Avian influenza, Newcastle disease, infectious bronchitis, and infectious bursal disease are among the common viral diseases faced by Nigerian poultry farms. Fowl typhoid, coccidiosis, and aspergillosis are among the diseases of bacterial, parasitic, and mycotic origin, respectively, affecting chickens as well (Sato, 2024). These diseases can cause high mortality rates and lead to reduced productivity.

Avian colibacillosis, for instance, is a worldwide disease and also causes high mortality in poultry of a wide range of ages (Abalaka *et al*., 2017). Clinical signs include retarded growth in affected birds, decreased egg production, and egg quality. The diagnosis of the disease is usually established based on the clinical signs, detection, and identification of the causative agent, *Escherichia coli (E. coli)* from tissue samples of infected birds (Abalaka *et al*., 2017). Newcastle disease (ND) is a highly infectious viral disease affecting domestic, caged, and wild avian species worldwide. The disease is characterised by a high morbidity, mortality, and a sharp drop in egg production and quality, causing a devastating economic loss in the poultry sector (Ekiri *et al*., 2021). The ND is clinically manifested by gastrointestinal haemorrahage and ulcers, commonly seen in chickens, and severe atrophy and depletion of lymphocytes in the lymphoid organs (Ekiri *et al*., 2021). Ascaridiasis, also known as roundworm infection, is one of the most prevalent parasitic diseases affecting poultry farming worldwide. It is caused by *Ascaridia galli*, a large nematode that primarily inhabits the small intestines of infected birds. The disease is common in backyard, free-range, and commercial poultry farms where hygiene and biosecurity measures are not strictly implemented (Mehmood, 2025). This parasitic infection can lead to severe economic losses due to poor growth performance, reduced feed conversion rates, decreased egg production, and mortality in severe infestations. Routine diagnosis of ascaridiasis can be made by faecal examination to detect the eggs of the nematode, or the adult parasite can also be found in the intestine at the time of necropsy (Singh *et al.*, 2023; Mehmood, 2025). This case report investigates the causes of deaths and low performance in a flock of 600 one-year-old chickens reported to the University of Jos Veterinary Teaching Hospital, Jos, Nigeria.

CASE HISTORY AND INVESTIGATION

On 27th January 2025, a complaint of mortality in a flock of 600 one-year-old Isa Brown layer chickens raised on deep litter was brought to the Avian and Aquatic Clinic of the University of Jos Veterinary Teaching Hospital (VTH), Jos, Nigeria. Mortalities of 9, 15, and 10 were previously recorded in a space of three days with a complaint of a drop in egg production. The birds were being fed with self-milled feed. The farmer mentioned that the birds were dewormed using 1% oral Ivermectin (Kepromec®) in November 2024. There was no clear information on the vaccination history of the birds.

Postmortem findings

The postmortem findings in the carcasses presented included nasal discharges, congested combs and wattles, pericarditis, congested and friable liver, misshapened and peduculated ovarian follicles, necrotic caecal tonsils, frothy lungs, egg yolk peritonitis, petechial haemorrhages on and erosion of proventricular mucosae, pale and mucoid trachea, partial congestion of breast muscles, empty crop, pale spleen, and live worms were seen in the small intestine.

Microbial analysis

The organs harvested were seared, and the inocula were streaked on 5% Blood Agar and MacConkey agar and incubated aerobically at 37℃ for 24 hours. Some of the bacterial colonies that grew were suspended in sterile Nutrient broth, and from a turbid suspension, a swab was taken to seed the surface of Mŭeller-Hinton Agar by spread plate method for an antibiotic susceptibility test. The bacterial isolate was subjected to other biochemical tests, including Gram staining, oxidase, catalase, indole, methyl red, and sugar fermentation tests, as described by Olutiola *et al.* (1991).

Serological test

Fifteen blood samples were taken from live birds when the farm was visited, and the serum samples were subjected to haemagglutination inhibition (HI) test for Newcastle disease (ND) virus antibody titres using the beta technique that employs a constant 4 HAU of antigen against varying two-fold serial dilution of serum as described by WOAH (2021). The ND antigen used for the preparation of the 4 HA solution was sourced from the National Veterinary Research Institute, Vom, as the ND Lasota vaccine.

Other Laboratory Investigations

The live worms were taken for further parasitological examination, while organs such as spleen, heart, liver, and intestine were fixed in 10% formalin for histopathological investigation. The tissue samples were processed as described by Baker *et al.* (2000). Histopathological slides were examined and photographed using a digital camera (Toupe®).

Laboratory findings

Bacterial isolate from tissue inocula that grew on MacConkey agar was a lactose fermenter. The organism was a Gram-negative rod with the following biochemical profile: oxidase and citrate negative; catalase, lactose, sucrose, galactose, glucose, and sorbitol positive. A greenish metallic sheen was observed on Eosin Methylene Blue agar. The results of these biochemical tests were inputted into an online microbiology portal for bacterial identification (https://microrao.com), and the result was *Escherichia coli*.

Table 1 shows that the bacterial isolate was most susceptible to Enrofloxacin amongst other antibiotics. The parasite was identified as a nematode, *Ascaridia*

galli (Fig. 1a-d). The histopathologies of the vital organs are shown (Fig. 2a-d). Table 2 reveals the outcome of the Haemagglutination inhibition test conducted on serum samples.

Table 1. Antibiogram of *Escherichia coli* isolated from tissues of one-year-old layer chickens

Sensitive	Intermediate	Resistant
Enrofloxacin	Nucolamox®	Tylosin
Furaltadone	Embacolisol®	Oxytetracycline
Streptomycin		Colistin
Floricol		
Gentamicin		
Penstrep®		

Results interpreted based on IDEXX Laboratories (2019)

Table 2. Results of the Haemagglutination inhibition (HI) test done on serum samples

No. of samples	Titre
2	1:16
2	1:64
3	1:128
1	1: 256
1	1:512
4	1:1024
2	1:2048

Range:	16-2048
Modal titre:	1:1024
GMT:	8.0
% @ & above 1:128:	73.3%

Note: *The result shows that about 26% of samples tested have ND antibody titres below 1:128, which is considered the minimum protective ND antibody titre against the egg drop effect of the ND virus.*

Treatment

This included Enrobest® (20% Enrofloxacin) at 1 mL/2 L of drinking water + Povidone iodine (10% iodine) at 1 mL/2 L of drinking water for 5 consecutive days. Within this period, Caredex® (10% Mebendazole) was administered at 1 g/L of drinking water for 2 consecutive days.

Follow-up

Communication was open to the farmer and farm visit was done to assess the level of response to treatment. It was observed that mortality stopped 10 days post-treatment and egg production returned to normal thereafter.

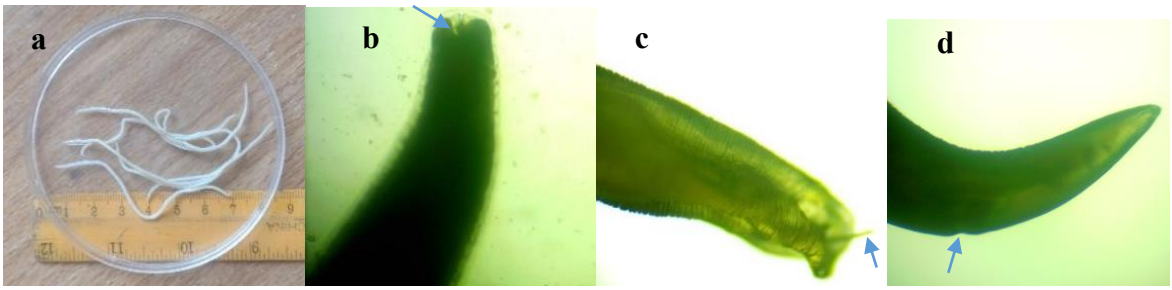

Fig. 1. *Ascaridia galli* isolated from the small intestine of a one-year-old layer chicken at postmortem examination (a). Anterior end showing prominent (trilobed) lips (b-arrow, x40); posterior end of male showing spicules (c-arrow, x40) and the posterior end of female showing the position of the cloaca (d-arrow, x40)

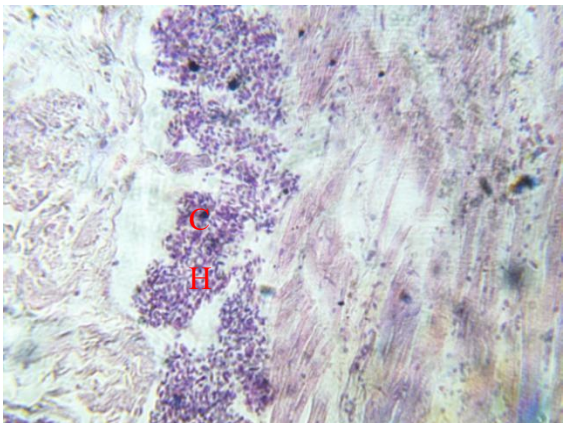

Fig. 2a. Photomicrograph of a section of the heart of a one-year-old layer chicken with vascular congestion (C) and haemorrhages (H) (H & E x400)

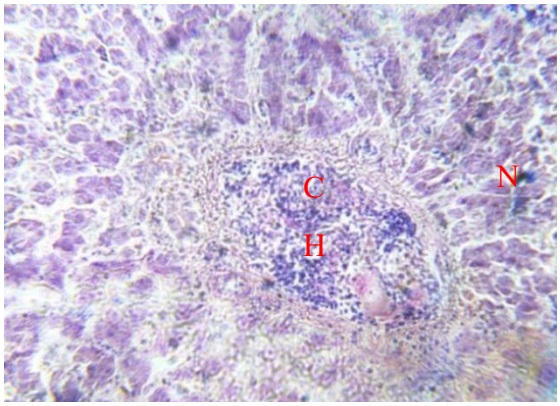

Fig. 2b. Photomicrograph of a section of the liver of a one-year-old layer chicken with severe congestion (C), haemorrhages (H), and hepatocellular coagulative necrosis (N) (H & E x400)

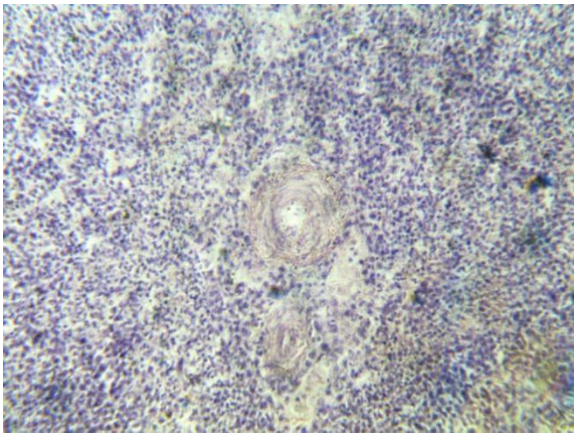

Fig. 2c. Photomicrograph of a section of the spleen of a one-year-old layer chicken. No observable microscopic lesions (H & E x400)

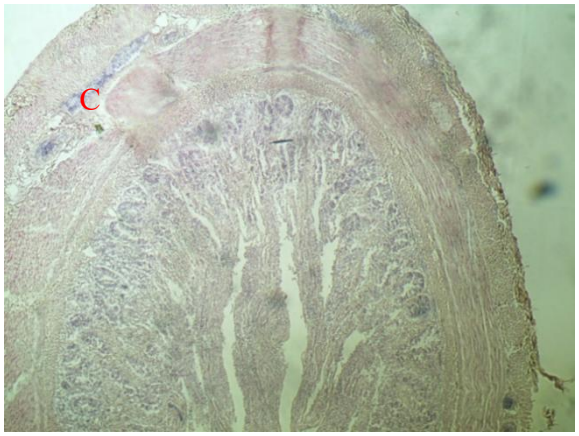

Fig. 2d. Photomicrograph of a section of the intestine of a one-year-old layer chicken with normal structure, but severe vascular congestion (C) (H & E x100)

DISCUSSION

Occurrence of avian colibacillosis and Newcastle disease (ND) is a common finding in the poultry industry; these duos are responsible for production losses, morbidity, and mortality (Bitrus *et al.*, 2025). Severe ascaridiasis in a flock of laying birds results in severe economic losses due to poor growth performance, reduced feed conversion rates, decreased egg production, and mortality. The presence of these diseases poses a significant challenge to poultry producers worldwide (Abalaka *et al*., 2017; Ekiri *et al*., 2021). From the case in hand, the mortalities of 9, 15, and 10 were previously recorded within three days, and a decline in egg production were suggestive of Newcastle disease. Morbidity and mortality associated with ND could lead to a reduction in production, profitability, and long-term financial viability of the poultry production value chain.

The postmortem findings of necrotic caecal tonsils, petechial haemorrhages, and erosion of the proventricular mucosae, pale and mucoid trachea, and partial congestion of breast muscles are some of the lesions consistent with ND (WOAH, 2022; Shafi *et al.*, 2023). It has been reported that acute stages of viscerotropic velogenic ND virus infections produce these lesions; however, these may be absent when birds die suddenly (WOAH, 2022; Badau *et al*., 2024). Newcastle disease produces lesions in the heart of the affected birds, revealing haemorrhages within the myocardium, which may appear as small red spots on the surface of the heart and within the myocardium (Shafi *et al.*, 2023). The vascular congestion and haemorrhages (Fig. 2a) reveal the impact of this disease on the heart tissues. The microscopic examination of the affected liver tissue section revealed marked

disorganization of hepatic architecture, congested central veins, haemorrhages, and hepatocellular coagulative necrosis (Fig. 2b). While the spleen and the intestine appear be normal (Fig. 2c & d), vascular congestion is noticed in the intestinal tissues (Fig. 2d). This suggests that this ND viral strain is less viscerotropic to these organs and probably lentogenic or mesogenic, even though performance in egg production receded possibly due to both the effect of ND virus (NDV) as well as the incriminating bacterium, *E. coli.* Although the vaccination status of the birds under study was not ascertained, it is possible that they were vaccinated against ND at an earlier stage, and the immunity had begun to wane (Table 2). While viral culture remains the gold standard for isolation and confirmation of NDV, the use of serologic tests like haemagglutination inhibition (HI) and enzyme-linked immunosorbent assay (ELISA) test gives promising outcomes. These tests are relied upon for the diagnosis of ND, estimating the seroprevalence of ND in poultry, and determining protective antibody titres in birds. This underscores the importance of laboratory diagnosis in accurately determining causal relationships with disease occurrence (Bitrus *et al.*, 2025).

As in this case, most farmers used untreated well water on their farms. This could be the source of the secondary bacterial infection implicated in the disease condition; hence. *Escherichia coli* is a common indicator for faecal contamination of water and is known to exacerbate other viral disease conditions, especially when the host's immune system is compromised (Bitrus *et al.*, 2025). This bacterium also causes lesions in multiple organs, including the liver, the heart, and ovarian follicles, resulting in high morbidity and mortality, which drastically affects egg production. A laying hen suffering from *E. coli*-induced oophoritis or salpingitis may infect the internal egg before shell formation (Lutful-Kabir, 2010). The postmortem findings indicate this, being supported by the attendant histopathologies (Fig. 2a-b). Early intervention with appropriate antibiotics, combined with supportive care and vaccination, can reduce mortality and improve recovery, but prevention remains crucial. Microbial culture and sensitivity remain the diagnostic tool in the management of clinical cases. To treat the birds, the farmer was advised to use the most sensitive antibiotic, 20% Enrofloxacin (Table 2) at the dose rate of 1 mL/2 L in combination with Povidone iodine (10% iodine) at 1 mL/2 L in the drinking water of the birds for 5 consecutive days. While the former provides antibacterial activity, the latter serves as a systemic anti-viral preparation.

Ascaridia galli is the largest gut-dwelling helminth of chickens, which confers adverse effects on meat and egg production. Both the adult and immature parasites affect gut health, but larval stages play a major role in pathology (Shohana, 2023). This nematode was fully examined and identified (Fig. 1a-d). The microscopic lesions of *A. galli* infection in poultry are primarily characterised by intestinal villi hypertrophy and inflammatory cell infiltration, particularly eosinophils, lymphocytes, and macrophages. The histotrophic phase of larvae is characterised by the necrosis of Lieberkühn crypts (Malatji *et al*., 2019). In addition, infection with a significant number of adult nematodes causes occlusion of the small intestinal lumen, accompanied by intussusception of the intestine due to hypermotility, resulting in the death of the infected bird (Daş and Gauly, 2014). However, none of these pathologies seems to be noticed in the small intestine. This is probably due to their scant number in the intestinal lumen of the hosts. Moreover, the farmer had dewormed the flock about two months previously with ivermectin. This may have reduced the worm burden, leading to the healing process. However, the 10% mebendazole prescribed for the treatment of the case in hand is capable of eradicating the worms due to its specificity against roundworms and its broad-spectrum nature. Implementing proper management practices, regular deworming programmes, and maintaining strict sanitation of poultry pens can significantly control and prevent this condition.

CONCLUSION

In conclusion, this case underscores the importance of active disease monitoring, robust vaccination protocols, and biosecurity measures, including proper feed storage, limiting access to the farm to non-workers, regular cleaning, and disposal of litters, flock health monitoring, separation of sick birds, and good personnel hygiene protocols in poultry farms. A comprehensive management plan, including rapid therapeutic intervention, could prevent the resurgence of infectious diseases such as ND exacerbated by *E. coli* and *Ascaridia galli.* These can significantly reduce the impact of such infections and boost farm profitability.

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Conflict of interest

The authors declare that there is no conflict of interest.

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