Case report

A Case of Newcastle Disease and Avian Colibacillosis Co-infection in 4-week-old Broiler ~~n~~ Flock in Maiduguri, Nigeria

Abstract

Newcastle disease (ND) and a~~A~~vian colibacillosis (AC) outbreak occurred in a 200-bird commercial broiler flock in Maiduguri, Nigeria. Despite vaccinations, the flock experienced a 60% morbidity and 45% mortality rate. Symptoms observed in the bird~~'~~s included weakness, inappetence, diarrhea, nervous signs, and emaciation. Laboratory tests confirmed ND and AC infections. The outbreak highlights the economic impact of these diseases on the poultry industry in Nigeria. Recommendations include improved biosecurity measures, regular vaccination, and timely treatment of secondary bacterial infections. Public health concerns also arise due to the zoonotic potential of ND. Further research is needed to investigate vaccine failures and develop more effective prevention strategies.

Keywords: Newcastle disease; Broilers; *Escherichia coli*; economic losses; Poultry; Zoonosis

Introduction

Newcastle disease (ND) and avian colibacillosis (AC) are common infections in poultry. The disease combination is implicated in high cost of treatment, mortality and production cost in the poultry industry (Landman *et al*., 2017; Yehia *et al*., 2023). Newcastle;disease is caused by a virus of the family Pparamyxoviridae. The virus is divided into five different pathotypes:;viscerotropic neurotropicvelogenicstrain which causes hemorrhagic lesions in the gastrointestinal tract (GIT) of chicken; neurotropic velogenic strain that is responsible for respiratory and nervous signs,andis the leading cause of high mortality in birds;.mMesogenic strain which causes mild respiratory illness and low mortality;. Others include as well as lentogenic and asymptomatic enteric strains (Malik *et al*., 2021). Newcastle disease is highly contagious and is transmitted via aerosol, water, feeds and contact with infected birds. The disease is endemic in Nigeria and the economic losses due to ND in Nigeria was estimated at 1.4 billion Naira (estimate, 10 million Dollars),.rRepresenting a major economic lossesdrain in the poultry industry (Salihu*et al*., 2013). ND is listed among the notifiable diseasesby the World Organization for Animal Health(OIE) (Stear, 2005; Ashraf and Shah, 2014)

On the other hand, Colibacillosis, on the other hand, is a disease syndrome caused by *Escherichiacoli* (*E. coli*). It is one of the most common bacteria diseases of birds,.Colibacillosis is often associated with viral coinfection (Nolan *et al*., 2013; Shehata *et al*., 2024). Colibacillosis and viral coinfections are difficult to diagnose and treat or manage (Shehata *et al*., 2024). *E. coli* infection is one of the common causes of high economic bacterial disease of poultry wWorldwide, with young birds and immuno-compromised birds are the most susceptible (Shehata *et al*., 2024). The occurrence of Newcastle diseasesND and colibacillosisAC coinfection isare limited. Moreover, theND and ACboth diseases bearcause significant economic losses in poultry (Solomon *etal*., 2012). This report discussedds the clinical and microbiological characteristics of ND and AC in a four-week-old broiler flock in Maiduguri, Nigeria.

Case Presentation

Case History:

The study was carried out in a poultry farm housing 200 commercial broilers poultryflock at 4 weeks of age, in Maiduguri, Nigeria. The birds were reported to have been vaccinated against

ND using ND LaSota vaccine, Infectious Bursal disease (IBD) using IBD (Gumboro) vaccine and Marek's disease~~s~~ at day 1, week 2, and week 3 respectively. The case was reported to the University of Maiduguri Veterinary Teaching Hospital on 27th May 2023. The birds were reportedly reared under all-in, all-out system. They~~birds~~ were transferred from one pen to another to create room for space because of the increase in the size of the birds, and for new arrivals. The old pen was slightly larger than the current pen.

About three days after the birds were transferred, the flock attendants noticed that some of the birds had become weak, ~~.~~ ~~i~~Inappetent~~ce~~, ~~some~~ had greenish/whitish diarrhea (Figure 1) and exhibited~~with~~ nervous signs. At day 2 of this investigation, 60 out of the 200 birds had died. The mortality rose to ~~At the 3rd day~~ 100 ~~of the 200 birds had died~~ on day 3. All the birds showed signs of sickness, and the farmer administered some antibiotics combinations, which could not stop ~~but~~ the mortality ~~continued~~.

~~Up~~On physical examination, it was observ~~notic~~ed that the birds had soiled vents, were emaciated~~ion~~, and some had torticollis with diarrhea while others had diarrhea only. The feathers were roughed with signs of severe dehydration (panting, l~~L~~ethargy, pale wattle and combs). Postmortem lesions observed include congested lungs and trachea (Figure 2), as well as pinpoint hemorrhages at the caeca tonsil and small intestine (Figure 3). The case was tentatively diagnosed as ND~~ewcastle~~ based on clinical manifestations ~~investigation~~, postmortem examination, history and farm visitation.

Figure 1: Soiled vent ~~Greenish Diarrhea~~ (A) and~~with~~greenish feceson the floor~~Soiled Vent~~ (B) in a b~~B~~roiler c~~C~~hicken

Figure 2: Post-mortem lesions showing congested lungs, and trachea of the affected broiler chicken

Figure 3: Pinpoint hemorrhages at the caeca tonsil (A) and intestine (B) in the affected Broilers

Laboratory investigation

Pulled trachea, cloacal swab and blood samples were collected from affected chickens. Virus transport media (VTM) was used to stock the sample for about 12 hours before processing. The samples were divided into two, one part was transported to the Veterinary Mmicrobiology Llaboratory for bacteriological investigation while the remaining parts were transported to Vvirology Llaboratory, University of Maiduguri for serological test. Bacteriological tests that were conducted included Gram's staining, culture, biochemical identification and antimicrobial susceptibility testing (AST). Virology tests conducted include hemagglutination incubation (HI) and Hemagglutination (HA) tests (Figure 4).

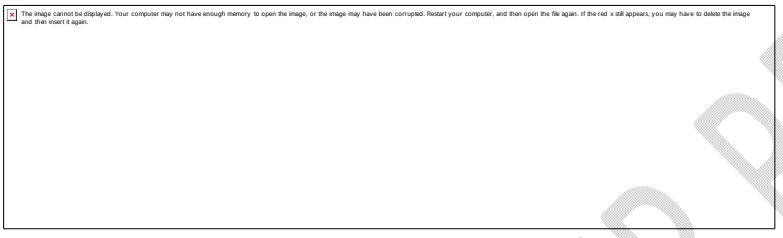

Figure 4:Haemagglutination (A) and haemagglutination inhibition (B) titre plates

Results and Discussion

In this report, we identified ND virus by hemagglutination and, hemagglutination inhibition (HA, HI) tests and *E coli*by culture, Gram's staining and biochemical tests. Based on epidemiological investigation, the morbidity rate at the farm was60%(120/200) (60%), while the mortality rate was45.0%(90/200) (45.0%). The results showed that the epidemiology ofNewcastle disease (ND) in this case was comparable to the average rate in commercial poultry breeds in Nigeria (Lawal *et al*., 2015).Pprevious research reported a 100% mortality in unvaccinated chickenscould reach 100% mortality (Abdul *et al.*, 2006). In Nigeria, the mortality rate among exotic breeds could range from 40-80% (Saidu*et al*.,2006). *Newcastle disease in among the diseases listed as a notifiable disease in the OE list (Stear, 2005; Ashraf & Shah, 2014)* This should move to an appropriate part in the introduction section, please. In this report, we identified ND by Hemagglutinations and, Hem inhibition (HA, HI) test and isolation of *E coli*from six weeks old broilers presented with diarrhea and nervous signs.

*The results of the antimicrobial susceptibilitytesting(AST) advertised in the Laboratory investigation section were not shown and there was no discussion on the bacterial coinfection. Authors should, please, provide the results and discussions on bacterial coinfection.

Close habitation of the poultry flock with in-contact humans occasioned by housing the birds near ~~The birds were kept in~~the residential areas~~. This~~ may ~~present~~ be of serious public health concerns. This follows the fact that NDV can cause mild conjunctivitis because of zoonotic transmission through aerosols, contact with mucous membrane and other routes from ~~an~~ infectedbirds to susceptible or immune-compromised humans (Fadiga*et al*., 2013).

Newcastle disease virus coinfection with pathogenic *E. coli* may present severe outcome. Hence, we recommend prompt action against secondary bacterial infection. Also, antimicrobial susceptibility testing is recommended to achieve effective treatment and minimize emergence of resistant strains (Ejeh*et al*., 2017).

The identification of NDV antigen in a vaccinated flock presents a serious economic and veterinary challenge. The possible explanations for this observation may be because of break in cold chain, antigenic variation, and reversion to virulence (Solomon *et al*., 2012). t~~herefore,~~W~~w~~e, therefore, recommend further studies~~y~~ to identify the cause of vaccine failures or the non-protection ~~byvaccine~~of vaccinated flock from infection as observed in this report.

*Discussion of this case is very scanty. I know it is a case report, but efforts should be made by the authors to have a proper discussion.

References

Ahmed, A. A., Salem, H. M., Hamoud, M. M., & Amer, M. M. (2025). Avian Colibacillosis, Multidrug Resistance, Antibiotic Alternatives: an Updated Review. *Egyptian Journal of Veterinary Sciences*, 1-21.

Amoia, C. F. A. N. G., Nnadi, P. A., Ezema, C., &Couacy-Hymann, E. (2021). Epidemiology of Newcastle disease in Africa with emphasis on Côte d'Ivoire: A review. *Veterinary World*, *14*(7), 1727.

Landman, W. J. M., Vervaet, C., Remon, J. P., Huyge, K., & Van Eck, J. H. H. (2017). Primary Newcastle disease vaccination of broilers: comparison of the antibody seroresponse and adverse vaccinal reaction after eye–nose drop or coarse spray application, and implication of the results for a previously developed coarse dry powder vaccine. *Avian Pathology*, *46*(4), 451-461.

Yehia, N., Salem, H. M., Mahmmod, Y., Said, D., Samir, M., Mawgod, S. A., ... &Zanaty, A. M. (2023). Common viral and bacterial avian respiratory infections: an updated review. *Poultry science*, *102*(5), 102553.

Getabalew, M., Alemneh, T., Akeberegn, D., Getahun, D., & Zewdie, D. (2019). epidemiology, Diagnosis & Prevention of Newcastle disease in poultry. *Am J Biomed Sci Res*, *16*, 50-9.

Abdisa, T., &Tagesu, T. (2017). Review on Newcastle disease of poultry and its public health importance. *J. Vet. Sci. Technol*, *8*(3), 441.

Malik, Y. S., Arun Prince Milton, A., Ghatak, S., Ghosh, S., Malik, Y. S., Arun Prince Milton, A., ... & Ghosh, S. (2021). Newcastle disease and other avian paramyxoviruses. *Role of Birds in Transmitting Zoonotic Pathogens*, 79-91.

Fadiga, M. L., Jost, C., &Ihedioha, J. (2013). Financial costs of disease burden, morbidity and mortality from priority livestock diseases in Nigeria: Disease burden and cost-benefit analysis of targeted interventions. *ILRI Research Report*.

Abdu, P. A., Tekdek, L. B., Umoh, J. U., Usman, M., & Oladele, S. B. (2006). Newcastle disease in Nigeria. *Nigerian Veterinary Journal*, *27*(2), 23-32.

Daodu, O. B., Aiyedun, J. O., Kadir, R. A., Ambali, H. M., Oludairo, O. O., Olorunshola, I. D., ... & Baba, S. S. (2019). Awareness and antibody detection of Newcastle disease virus in a neglected society in Nigeria. *Veterinary world*, *12*(1), 112.

Solomon, P., Abolnik, C., Joannis, T. M., &Bisschop, S. (2012). Virulent Newcastle disease virus in Nigeria: identification of a new clade of sub-lineage 5f from livebird markets. *Virus genes*, *44*, 98-103.

Saliu, O. J., Sanda, M. E., Dairo, F. A. S., &Salihu, I. (2013). An Analysis of Benefit and Cost of Local Chicken Production By the Adopters and on–Adopters of Newcastle Disease Vaccination in Kogi–State, Nigeria. *Nigerian Journal of Animal Science*, *15*, 229-240.

Nolan, L. K., Barnes, H. J., Vaillancourt, J. P., Abdul-Aziz, T., & Logue, C. M. (2013). Colibacillosis. *Diseases of poultry*, 751-805.

Lawal, J. R., Jajere, S. M., Mustapha, M., Bello, A. M., Wakil, Y., Geidam, Y. A., ... &Gulani, I. A. (2015). Prevalence of newcastle disease in Gombe, Northeastern Nigeria: a ten-year retrospective study (2004–2013). *British Microbiology Research Journal*, *6*(6), 367-375.

Shehata, A. A., & Hafez, H. M. (2024). Colibacillosis. In *Turkey Diseases and Disorders Volume 1: Bacterial and Fungal Infectious Diseases* (pp. 29-45). Cham: Springer International Publishing.

Weerts, E. A., Matthijs, M. G., Bonhof, J., van Haarlem, D. A., Dwars, R. M., Gröne, A., ... & Jansen, C. A. (2021). The contribution of the immune response to enhanced colibacillosis upon preceding viral respiratory infection in broiler chicken in a dual infection model. *Veterinary immunology and immunopathology*, *238*, 110276.

Ashraf, A., & Shah, M. S. (2014). Newcastle disease: present status and future challenges for developing countries. *African Journal of Microbiology Research*, *8*(5), 411-416.

Stear, M. J. (2005). OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Mammals, Birds and Bees) 5th Edn. Volumes 1 & 2. World Organization for Animal Health 2004. ISBN 92 9044 622 6. € 140. *Parasitology*, *130*(6), 727-727.

Ejeh, F. E., Lawan, F. A., Abdulsalam, H., Mamman, P. H., &Kwanashie, C. N. (2017). Multiple antimicrobial resistance of Escherichia coli and Salmonella species isolated from broilers and local chickens retailed along the roadside in Zaria, Nigeria. *Sokoto Journal of Veterinary Sciences*, *15*(3), 45-53.