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Aspergillosis in Poultry: Impact and Flock Health Management - A Case Study

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Abstract

The global poultry industry, driven by high demand for meat and eggs, faces significant challenges due to diseases like avian aspergillosis, particularly in developing countries. This fungal infection, caused by *Aspergillus fumigatus*, leads to respiratory issues, stunted growth, and high mortality in birds, posing economic losses and zoonotic risks. The disease thrives in environments with poor ventilation and contaminated feed or litter. This case report examines a 5-week-old pullet flock in Ibadan, Nigeria, where a mortality pattern was observed after prolonged antibiotic use with self-formulated feed. Necropsy revealed cachexia, sinusitis, and greyish lung nodules, with cultures confirming *Aspergillus fumigatus* and *Escherichia coli*. Sample of feeds was subjected to laboratory testing and there were growth of *Aspergillus sp* when cultured, hence the infection source was traced to contaminated feed, underscoring the need for stringent quality control and biosecurity measures. The treatment of the birds involved changing the feed and administering nystatin and florfenicol, leading to recovery within five days. This study highlights the importance of proper feed management and biosecurity to prevent aspergillosis outbreaks. Educating farmers on risks associated with contaminated feed and implementing effective control measures can reduce infection incidence. Ensuring regular feed testing, proper storage, and the use of antimicrobial additives are essential strategies. The zoonotic potential of aspergillosis emphasizes the need for preventive measures to protect human health, particularly among farm workers and immuno-compromised individuals. By addressing these challenges, poultry health and productivity can be improved, contributing to the sustainability of the industry.

Introduction

Poultry farming involves raising poultry in intensive commercial or small flocks, providing high-quality protein and low fat, making it a widely consumed meat worldwide (Garrigus, 2024). The global demand for poultry meat and eggs has led to a massive livestock farming industry, with over 26 billion chickens currently existing (Ebrahimi-Nik *et al*., 2018). *Avian aspergillosis* is among the major causes of economic loss in the poultry industry worldwide, with a more vivid impact on developing countries (Abd El-Ghany, 2021). Aspergillosis is a significant fungal disease in poultry caused by *Aspergillus fumigatus*, which thrives in various conditions and readily disperses spores through the air and environment (Kwon-Chung and Sugui, 2013). It can infect birds by inhaling spores, causing respiratory problems, stunted growth, and serious mortality. Aside from serious health risks to poultry, it leads to economic losses and potential zoonotic transmission to humans. The high cost of feed

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materials and their availability have led to sharp practices among feed millers and raw materials sellers.

Aspergillus species are ubiquitous, and the disease can be found wherever environmental conditions favour fungal growth. Contaminated straw bedding and feeding of mouldy grain contribute to exposure (Ameji *et al*., 2020). Avian aspergillosis affects a wide range of bird species. Risk factors include stress, inappropriate husbandry, nutritional deficiencies, immunesuppression, corticosteroid use, and long-term antibiotic use, which increase susceptibility. Environmental conditions such as humidity and poor ventilation also play a role (Kapetanov *et al.,* 2011).

The Clinical Signs and Lesions of Avian Aspergillosis includes the following:

- Respiratory Distress: Sick birds often display dyspnea (laboured breathing) due to lung and air sac involvement.
- Inappetence: Infected birds may exhibit reduced appetite.
- Emaciation: Aspergillosis can lead to weight loss and general unthriftiness.
- Neurologic Form: In some cases, a neurologic form may present with signs like torticollis (twisted neck), paralysis, and tremors (Nururrozi *et al*., 2020)

Transmission and spread within poultry flocks occur through environmental factors such as contaminated litter, feed, and poor ventilation. High-risk conditions and age groups include young chicks and immuno-compromised birds. In Oyo State, Nigeria, the poultry industry is a cornerstone of the livestock sector, and the prevalence of Aspergillosis is a threat to the liveability of the business. Transmission to humans occurs primarily through inhalation of spores, with risk groups including immune compromised individuals and poultry workers. Environmental contamination with *Aspergillus* conidia in poultry farms represents a significant risk for farm workers (Cafarchia *et al.,* 2014).

Previously reported cases include:

- Outbreak of aspergillosis in a flock of geese in Zaria (Sa'idu *et al*., 2016).
- Identification of *Aspergillus* species in feed fed to caged birds using morphological characteristics in Zaria, Nigeria (Ibrahim *et al*., 2017).
- Clinico-pathological features and management of aspergillosis in some poultry farms in Jos metropolis, Nigeria (Ameji *et al*., 2020).
- *Aspergillus* spp. isolated from lungs of poultry (*Gallus gallus*) at the Mycology Laboratory, School of Veterinary Medicine, Universidad Nacional, Heredia, Costa Rica between 2008 and 2021 and associated factors (Ulloa-Avellán *et al.,* 2023).
- Prevalence of chronic pulmonary aspergillosis in two tuberculosis treatment clinics in Lagos, Nigeria: A prospective longitudinal study (Davies *et al*., 2024).

Case presentation of aspergillosis in 5-week-old pullets

History

A flock of 5-week-old commercial pullets was presented at the Poultry Unit of the Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan. The flock, consisting of 2000 birds, exhibited a mortality pattern of 6, 10, and 12 birds over the previous three days with prolonged use of different antibiotics. The farm used self-milled feed, borehole water, and housed the birds on deep litter.

Necropsy Findings

- Cachectic carcasses
- Cooked breast muscle
- Sinusitis
- Areas of pallor on the liver
- Lungs with greyish nodules (as illustrated in Fig. 1)

Necropsy examination, culturing, and sensitivity tests revealed the presence of *Aspergillus fumigatus* and *Escherichia coli,* as revealed in Table 1 below. The following drugs were identified as sensitive:

Table 1. Laboratory result of antibiotic sensitivity test carried out on the submitted Carcass sample

SENSITIVE	NTERMEDIATE	RESISTANT
Florfenicol	Enrofloxacin	Augmentin
Colistin	Steptomycin	Ceftriazone
Gentamicin		Oxytetracycline

Isolate; *Escherichia coli, Aspergillus fumigatus*

Confirmatory diagnosis*: Systemic bacteria Disease, Fungal Infection*

The laboratory recommends administering 20% Florfenicol at a dosage of 20 mg per kilogram of body weight via drinking water for birds. This treatment should be complemented with Nystatin (500,000 I.U. tablets) at a rate of five tablets per 500 birds daily for five days. Additionally, it is advised to remove caked feed from feeders, ensure proper feed storage practices, and include organic acid at a concentration of 1 kg per ton during feed milling.

All lung cultures showed growth of fungal colonies after 3 days of incubation in Sabouraud's dextrose agar with chloramphenicol (0.05 mg/mL) under aerobic conditions at 25ºC. Initially white, the colonies gradually turned yellowish-brown as conidia matured, particularly around the centre. Conidial masses turned grey-brown by day 5, as shown in Fig 2, and were transferred to microscopic slides using Lactophenol cotton blue stain, revealing mycelia consisting of tubular septate hyphae.

Fig. 1. Greyish nodules in the lungs

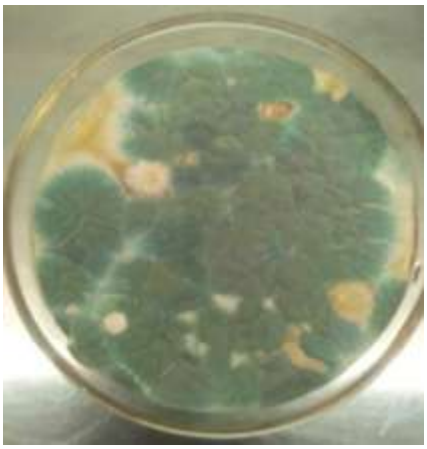

Fig. 2. The lung's culture on Sabouraud's dextrose agar with chloramphenicol (0.05 mg/mL)

Water and feed samples were requested for microbial analysis to trace the source of the infection. Tables 2 and 3 show the results of water and feed microbial analyses, respectively.

Treatment Plan

The farmer was advised to change the feed and spray the feed store with $CuSO_4$ at 1 gram to 3 liters of water. The birds were administered Nystatin 500,000 UI along with florfenicol at 20 mg per kg body weight for 5 days. The flock recovered within 5 days with no signs of reinfection.

Discussion

The poultry business is common and easily accessible in southern Nigeria as supported by Falodun (2023), this exposes the industry to several categories of people with little or no knowledge of standard practices leaving the farmers at the mercy of all and sundry for consultation and technical know-how including cost management. There are few reports on the prevalence of *Aspergillus sp* in avians, although it is the causal agent of a serious disease in these species as supported by Ulloa-Avellán (2022), this may be due to the fact that the disease is multifaceted and presents as a complication with other bacterial diseases of economic importance in poultry farming.

Aspergillosis is a disease that affects various ages and types of birds, without restriction. This fact is supported by Abd El-Ghany (2021). All the characteristic and typical necropsy findings in this investigation align with the observations made by Leishangthem *et al*. (2015) and Sa'idu *et al*. (2016), indicating a consistency in the presentation of gross lesions associated with aspergillosis across different studies.

Table 2: Water microbial analysis result

Source	Coliform (cfu/100µl)	Non Coliform (cfu/100µl)	*E coli*	*Klebsiella spp*	Mould (cfu/100µl)	*Vibro spp*. (cfu/100µl)
	0	0	-	-	0	0

cfu means colony forming unit

Table 3: Feed microbial analysis result

Sample	Coliform cfu/gm ($x10^2$)	Non Coliform cfu/gm ($x10^2$)	*E coli*	*Klebsiella spp*	Fungi (cfu/gm ($x10^2$)	*Vibro spp*. cfu/gm ($x10^2$)
Sample A	0	0	-	-	Aspergilus fungatus (230) Cottony mold (4)	0

The identification of feed as the source of infection is a critical finding in understanding the epidemiology of the disease outbreak, this aligns with a previous study by Kromm and Lighty (2020) which provided substantial evidence indicating that contaminated feed can be a significant vector for pathogen transmission in poultry farming. Contaminated feed can harbour various pathogens, including bacteria, viruses, and fungi, which can lead to outbreaks of diseases like aspergillosis. These pathogens can proliferate in feed under certain conditions, such as high moisture content and improper storage, creating an environment conducive to their growth and survival (Kapetanov *et al.,* 2011). Also, farms with inadequate biosecurity measures will have high infection rate of aspergillosis. This reinforces the importance of maintaining stringent biosecurity protocols to mitigate the spread of fungal infections as supported by Butucel *et al.* (2022) and Pinto *et al.* (2023).

High cost of feed materials and the limited purchasing power of farmers have turned both farmers and feed miller to look for cheaper alternative sources of feed materials and ultimately feed price, the findings by Kromm and Lighty (2020) underscore the importance of stringent feed quality control measures.

Conclusion

In conclusion, the combination of gross lesions and fungal isolation confirmed the diagnosis of pulmonary aspergillosis due to Aspergillus spp., which has zoonotic potential. The zoonotic potential of Aspergillus species underscores the need for effective control measures to prevent transmission to humans, particularly farm workers and those with compromised immune systems. This case study also highlights the critical role of environmental factors and biosecurity measures in controlling aspergillosis in poultry farms. The findings emphasize the need for comprehensive strategies to mitigate the impact of this disease on poultry health and productivity, ultimately improving the overall health and sustainability of poultry farming. The increase in the price of feed raw materials has led farms to self-mill without knowing the quality of materials available to them. Improper storage of materials and finished feed products is also a challenge. Improving feed management practices is crucial for preventing disease outbreaks in poultry farms. Regular testing of feed for contaminants, proper storage practices, and the use of feed additives with antimicrobial properties are essential strategies to mitigate the risk of infection. Additionally, educating farmers about the risks associated with contaminated feed and the implementation of biosecurity measures can further reduce the incidence of feed-borne infections. Biosecurity measures should be adopted and reviewed regularly on farms. Eliminating pathogens in the feed store will help prevent reinfection and resistance.

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