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## Assessment of biosecurity measures against Newcastle disease in commercial poultry farms in Benue state, Nigeria

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### Abstract

Biosecurity is an integral part of any successful poultry production system. This study was conducted to assess the biosecurity practices in commercial poultry farms in four selected local government areas of Benue state, Nigeria. Twelve poultry farms were selected and assessed. The biosecurity practices in the poultry farms were assessed using a biosecurity checklist and structured questionnaires administered to commercial poultry farmers. Simple descriptive statistics using frequencies and percentages were used to summarize and present results. The results revealed that 83.3% (10/12) of the farms kept birds on deep litter, 16.7% (2/12) kept birds on both deep litter and in cages. Higher proportion 66.7% (8/12) of farmers operated backyard poultry farms. Results showed that 25% (3/12) of the farms also had free range poultry within poultry house premises and none (0/11) kept birds of different ages within the same pen but 41.7 % (5/12) of the farms had several flocks of different ages on the same farm. Only 50% (6/12) of the farms had foot dips in front of each pen. Some farms 41.7% (5/12) had abandoned materials near poultry houses while 33.3% (4/12) had dense vegetation around their poultry farms. About 50% (6/12) of farms reported that rodents/wild birds had access to feed stores. The main source of drinking water for the birds in most of the farms was well water (66.7%) and 36.4 % (4/11) have a dam or pond within farm premises. In most of the farms, workers had no specific clothes 75% (9/12) and foot wear (91.7%) for farm operations. The study revealed that poor management had the highest biosecurity risk score (60.4%) in the commercial poultry farms studied in Benue state. There is need for qualified professionals to train poultry farmers, managers and attendants on proper biosecurity practices.

**Keywords:** Biosecurity, Benue state, commercial poultry farms, Newcastle disease

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### Introduction

The importance of poultry production to the biological needs, economic and social development of the people of any nation cannot be over emphasized (Oladeebo & Ambe-Lamidi, 2007). The growth and development of the poultry industry in Nigeria are being threatened by outbreaks of infectious diseases such as Newcastle disease (ND) and highly pathogenic avian influenza (HPAI) causing

high mortality and huge economic losses to farmers (Augustine et al., 2010).

Biosecurity refers to measures taken to prevent or control the introduction and spread of infectious agents to a flock. Such infectious agents, whether they cause clinical or subclinical disease, significantly reduce the productivity, profitability and long term financial viability of a poultry operation (COA, 2009).

There are two categories of biosecurity namely biocontainment involving quarantine and other measures designed to keep the virus on infected farm or area and exclusion biosecurity aimed at keeping the virus out of disease free farms or area (Swayne & Jackwood, 2008). Biosecurity has three major components:

Isolation—involves keeping of poultry protected from sources of infection including unauthorized access and carriers of disease and separating groups of animals to minimize the spread of infection across the population. Traffic control – involves limiting incoming traffic and traffic within the farm and controlling the movement of equipment, vehicles, people, feeds, birds and eggs to prevent exposure to disease. Sanitation – involves regular cleaning and disinfecting housing, equipment, vehicles, and people to destroy disease agents (USAID, 2009).

The Food and Agriculture Organization of the United Nations (FAO) has defined four production systems based partly on the biosecurity measures implemented (Adene & Oguntade, 2006). In Nigeria, the structure of the commercial poultry industry consists mostly sector 2 and 3 systems with little or no biosecurity and constant introduction of new birds from relatively unknown sources which worsen the biosecurity problems (Pagani *et al.*, 2008, AICP, 2009). Biosecurity level in commercial poultry production systems is minimal or in some cases non-existing and this may lead to the spread of multiple infections within and between farms (Permin, 1997). Previous studies in Kogi and Kano states, Nigeria revealed that farmers' practices such as keeping of multi-aged and multi-species poultry on the same farm, improper disposal of dead poultry and contaminated litter, poor farm traffic control and sanitation were identified as major biosecurity risks in commercial poultry farms (Ameji *et al.*, 2012; Wakawa, 2012). However, no work has been conducted to assess the biosecurity of poultry farms in Benue state, Nigeria from available literature. Hence, there is a need to establish the baseline data on the level of adherence to biosecurity procedures by poultry farmers in the state. The data generated would assist in establishing the possible role poultry

farms play in the epidemiology of ND and other emerging infectious avian diseases in Nigeria.

## Materials and Methods

### *Study area*

The study was conducted in Benue state located in the north central zone of Nigeria. The state lies within longitude 7° 47' and 10° 0' East, Latitude 6° 25' and 8° 8' North of the Equator and shares boundary with Nasarawa, Taraba Cross River, Enugu and Kogi states and the republic of Cameroun. Benue state has an estimated total poultry population of 6,735,041 (Adene & Oguntade, 2006).

### *Sampling technique*

Four Local Government Areas were randomly selected which included Gboko, Kwande, Makurdi and Otukpo LGAs. Twelve commercial poultry farms were selected from these four LGAs using the poultry farm register obtained from the avian influenza desk officer of the state, based on the farm being operational together with consent and readiness of the farms to participate in the study.

### *Assessment of biosecurity in commercial poultry farms*

The assessment of biosecurity practices in the poultry farms was undertaken through the use of a structured questionnaire and a checklist. The questionnaire was designed and pretested before it was administered to the poultry farmers. The questionnaires were administered in English and translated to local languages of Tiv, Idoma and Igede where necessary. Detailed information was obtained on farm location, source of birds and management practices. Information was also obtained on biosecurity practices, such as methods of litter and carcass disposal. The checklist sought to assess the biosecurity features present on the farm such as those in the environment, and flock characteristics that may increase the risk of introducing, maintaining or spreading diseases on the farm and estimated the risk level. Personal observations of farm premises and activities were used to validate the responses of the respondents during the questionnaire administration.

### *Criteria used for scoring biosecurity risk levels*

Scoring of risk levels was done using a numerical system of 0-3 adopted from USAID (2009) (Table 1).

**Table 1:** Criteria used for scoring biosecurity risk levels

Biosecurity risk levels	Biosecurity practices/features
0 = No risk	None present or no contact observed
1 = Low risk	Minimal present or no contact observed
2 = Moderate risk	Some present and or minimal contact observed
3 = highest risk	Significant amount present or significant contact observed

### Data analysis

The data obtained from the questionnaires and checklists were analyzed by descriptive statistics using Statistical Package for Social Sciences version 17.0 program (SPSS Inc. Chicago, IL, USA). The frequency and percentages were calculated.

### Results

Out of the 12 farms which took part in the study, one farm did not answer all questions as shown in the results. Farm location showed that only 9.1% (1/11) farms were located within slaughter area, 36.4% (4/11) have a dam or pond within farm premises (Table 2). However, none (0/11) was located in high poultry farm density area though 8.3% (1/12) of the farms was located along a main road. Some 36.4% (4/11) farms allowed free access to farm while 8.3% (1/12) of farms have no lock on doors. There were free range poultry within 25% (3/12) of farms. A total of 83.3% (10/12) of the farms surveyed kept poultry on deep litter, 16.7% (2/12) kept birds on both deep litter and in cages. Results showed that 66.7% (8/12) farms use only well as source of drinking water for their birds with 33.3% (4/12) using water from multiple sources (Tap 8.3% (1/12), borehole 16.7% (2/12), river/stream 8.3% (1/12)). Results of the study showed that 41.7%

(5/12) farms had abandoned materials near poultry houses, 33.3% (4/12) had dense vegetation within their poultry farms and 18.2% (2/11) spread or piled manure near poultry houses while 25% (3/12) of farms discard feed from previous flock near poultry houses. About 50% (6/12) of farmers reported that rodents/wild birds had access to feed stores while 50% (6/12) also reported that feed became wet in stores or feeders. Improper disposal of dead birds within the farm was reported in 18.2% (2/11) farms (Table 3). About 63.6% (7/11) of farmers sourced their birds from distributors without knowing the hatchery. Only 50% (6/12) of the farms have foot dips in front of each pen while in 50% (6/12) of farms, employees move from pen to pen without disinfection and 55.6% (5/9) move from pen to pen without consideration of age and health status of the birds. None (0/12) of the farms kept chicken with other poultry species in the same pen but 25% (3/12) kept poultry of different species on the same farm. Nonetheless, 41.7% (5/12) of farms kept several flocks of different ages on the same farm. Result showed that 36.4% (4/11) farms employees live on the farm and 63.6% (7/11) did not live on the farm (Table 4). In none of the farms do workers have specific clothes for farm operations

**Table 2:** Isolation and traffic control biosecurity risk level in some commercial poultry farms in Benue state, Nigeria

Isolation and traffic control	Response to biosecurity risk (%)	Risk level
Free access to farm	4/11 (36.4)	3
No lock on doors	1/12 (8.3)	1
Farm located close to slaughter area	1/11 (9.1)	2
Farm located along main road	1/12 (8.3)	2
Village poultry within farm	3/12 (25)	3
Farm located in poultry dense area	0/11 (0)	0
Presence of dam or pond within farm	4/11 (36.4)	3
Overall	17.5%	2.0

Risk level: 0 = No risk; 1= low risk; 2 = Moderate risk; 3 = Highest risk level –

**Table 3:** Unsanitary practices and biosecurity risk levels in some commercial poultry farms in Benue state, Nigeria

Sanitation practices	Response to biosecurity risk (%)	Risk level
Presence of dense vegetation within farm	4/12 (33.3)	3
Presence of abandoned materials near poultry house	5/12 (41.7)	2
Discard feed from previous flock near poultry house	3/12 (25)	2
Spreading or piling manure near poultry house	2/11 (18.2)	3
Feed get wet in stores or feeders	6/12 (50)	3
No proper disposal of dead birds	2/11 (18.2)	2
Farm workers move from pen to pen without disinfection	6/12 (50)	3
Overall	34.1%	2.6

Risk level: 0 = No risk; 1= Low risk; 2 = Moderate risk; 3 = Highest risk level

**Table 4:** Biosecurity practices associated with management practices in some commercial poultry farms in Benue state, Nigeria

Management practices	Response to biosecurity risk (%)	Risk level
Flocks obtained from more than one distributor	7/11 (63.6)	3
Flocks of different age within the same farm	5/12 (41.7)	2
Flocks of different species within the same farm	3/12 (25)	3
Presence of foot dip	6/12 (50)	3
Rodent/wild birds have access to feed store	6/12 (50)	3
Farm employee do not live on farm	7/11 (63.6)	3
Farm workers do not wear specific cloth for farm operations	9/12 (75)	3
Farm workers do not wear specific foot wear	11/12 (91.7)	3
Farm workers do not wear gloves and face mask	10/12 (88.3)	2
Overall	60.4%	2.8

Risk level: 0 = No risk; 1 = Low risk; 2 = Moderate risk; 3 = Highest risk level

with 75% (9/12) reporting that poultry attendants wear same cloth when going between pens. In 91.7% (11/12) of farms, workers do not have specific foot wear for work and 66.7% (8/12) do not shower before entering poultry house with 83.3% (10/12) reporting that their workers do not wear gloves and face mask respectively (Table 4).

## Discussion

The study revealed that contrary to reports from other states in Nigeria such as Abuja, Plateau and Kano states, poultry farms in Benue state were not concentrated in a particular area but are dispersed which might be due to difference in town planning policy with no designated farm areas in Benue state unlike Kano and Abuja where particular areas are designated for farms (Wakawa, 2012; Balami *et al.*, 2014). Hence the risk of spread of ND and other avian diseases between farms due to close proximity will be reduced and the practice of poor biosecurity by a farm is less likely to endanger the investment of a neighboring farm. The study also revealed that most farms do not have gate or fence thereby allowing unrestricted access to the farms by unauthorized visitors, animals, equipment or carriers of ND virus in to the farm. This practice would allow disease transmission as humans can serve as mechanical transmitters of ND (Cardona & Kuney, 2002; Augustine *et al.*, 2010). The unrestricted access of unauthorized persons and animals in some commercial poultry farms in Benue state as reported in this study highlights risk posed by failure of biosecurity measures in isolation and traffic control with respect to ND (Adene & Oguntade, 2006). However, the presence of village poultry within commercial poultry farms kept on free range may increase the risks of introduction of NDV to the commercial poultry flock as these local poultry have

constant contact with wild birds and poultry litter from other farms used on crop farms as manure (Assam *et al.*, 2012). Similarly, the practice of poultry attendants keeping local poultry at home and none utilization of protective clothing by these attendants may also increase the risk of ND from local poultry to the commercial poultry. The risk of local poultry in introducing NDV to commercial poultry is further supported by previous study indicating that local poultry flocks maintains the NDV in circulation and act as reservoirs and carriers (Assam *et al.*, 2011; Lawal *et al.*, 2016). This study also revealed that some poultry farms have in their vicinity ponds and dams a converging point for wild water fowls, ducks and other migratory birds which have been identified as reservoirs of ND virus which may also increases the risks of NDV introduction and maintenance (Echeonwu *et al.*, 1993; Oladele *et al.*, 2012; Wakawa *et al.*, 2012).

Some of the poultry farms have dense vegetation within the farms and also abandoned materials near poultry houses. This highlights poor hygiene and sanitation practices of commercial poultry farmers in the study area. Bushy surroundings around poultry farms would allow breeding of insects and rodents which will attract wild birds and reptiles likely to introduce NDV into the farm (Wakawa *et al.*, 2012). These rodents and wild birds may have access to poultry feed and might contaminate the feed and litter with their excrement containing infectious diseases agents (Cardona & Kuney, 2002). The practice of sourcing birds from more than one hatchery by the poultry farmers is a risky practice as this may encourage the introduction, maintenance and spread of pathogens into the farms which could result in disease outbreak (Warwick *et al.*, 2012). The practice of keeping birds of different ages on the same farm was observed in the study. The

implication is that, multiple ages in the same premises may encourage the spread of disease from both actively infected birds and recovered carriers, particularly if birds of different ages are closely associated through management practices or proximity (Zander *et al.*, 1997). Management systems where birds of all ages are raised together in a farm also increase the chances to lose all birds whenever epidemics occur such as in Newcastle diseases (Kirunda & Mukiibi-Muka, 2003). However, FAO recognizes that age separation would not be feasible in developing countries as the sale of all animals at a fixed age is not practiced by most farmers, who keep several ages to ensure production throughout the year (Alhaji & Odetokun, 2011; FAO, 2008). Majority of farms had no foot dips at the entrances of their poultry house. This implies that most of the farms stand the risk of encountering outbreak of diseases because the restriction of pathogens into poultry houses is very minimal. The foot dips serves as first line of protection to the poultry and its absence would expose poultry to infection carried by attendants on their shoes (USAID, 2009).

The practice of farm employee not living on the farms as observed in this study may also increase the risk of bringing disease agents in to the farm. These poultry attendants may have village poultry at home or even visit live poultry markets and other poultry farms where they can carry infectious disease agents on their clothes and shoes and bring them to the

farm. Non provision of uniforms and shoes to farm attendants or employee increases the chance of using house clothes and shoes on the farms. These clothes might have had contact with local poultry at home, or pick infectious agents from outside and bring them into the farm thereby compromising commercial farm biosecurity (USAID, 2009). The study revealed that commercial poultry farmers' biosecurity practices were poor. Assessment of biosecurity risk level of the poultry farms studied revealed that isolation and traffic control had the lowest risk level of 2.0 while sanitation practices and management practices had risk levels of 2.6 and 2.8 respectively. The aforementioned findings implies that NDV infection can be greatly reduced in these farms by improving the level of biosecurity practices through training of farm workers, monitoring and enforcement of these practices on the farms. It is recommended that commercial poultry farmers in Benue state be trained on poultry biosecurity so as to improve on their management practices as this will reduce the risk of ND introduction and maintenance within the farms thereby curbing production losses due to Newcastle disease.

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