



## Community biosecurity: A new approach to reduce infectious diseases including avian influenza in commercial poultry

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### Abstract

To reduce the load of infectious diseases including avian influenza, a community involving poultry biosecurity model was piloted in Bogura, a northern district of Bangladesh from 2013 to 2017 for developing flock immunity in breeder farm and the community reached chicken like a win-win situation. The experiment started by selecting a commercial breeder farm where about 30,000 poultry were kept and had a record of being affected by avian influenza. The activities were the assessment of the poultry population within a kilometer radius of the breeder farm, providing health care services by a trained poultry health worker, vaccinating all village native chickens in the area above against Newcastle disease (ND), and Fowl pox, monitoring the level of antibody after vaccination against ND, and identifying the causes of sickness and mortality. When any bird died with clinical signs of AI, all surviving birds from that flock were purchased and culled off that household poultry immediately (spot culling), and proper disinfection was done by supervising the health worker. Affected farmers are provided compensation by the breeder farm. The results showed that the overall flock immunity against ND in the 3rd year was 90% at the community level, whereas on the breeder farm, it was 95% and 97% respectively against ND and AI in the selected area. However, the village chicken mortality due to infectious disease was significantly reduced, and no mortality was recorded due to ND or Fowl pox. The poultry population in that area increased twice at the end of the project. There were 13 cases of avian influenza A/H5N1 confirmed by rRT-PCR from village chickens in those surveyed areas, and no positive case was perceived on that commercial breeder farm. From the study, it was concluded that community biosecurity has a positive role in reducing infectious diseases, including avian influenza, in commercial farming.

**Key words:** Biosecurity, community, infection, avian influenza, Newcastle disease.

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### Introduction

Biosecurity practice is an important tool to prevent the introduction and spread of infectious diseases, including Highly Pathogenic Avian Influenza (HPAI). Biosecurity is a set of strategies and

management practices that reduce the risk of aquatic, pests and infectious diseases to an acceptable level in the facility and its immediate surroundings (WOAH, 2022). Biosecurity practices designed to minimize the transmission of infectious diseases

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between and within farms have been considered an important component of modern poultry flock health management programs (Anne *et al.*, 2012; Ali *et al.*, 2021). The importance of biosecurity increased after the emergence and spread of the H5N1 serotype of the HPAI virus, which has caused substantial poultry-related economic losses and public health concerns in relation to a potential pandemic (Ali *et al.*, 2019; Ali, 2020). Farmers can reduce the probability of infectious disease by implementing several indicators of biosecurity. This biosecurity concept was developed and practiced properly in the farming system in advanced countries, where the farming system practice is entirely different from Bangladesh. It has been observed that the traditional biosecurity approach cannot reduce the rate of outbreaks at a satisfactory level due to the high human and animal population density and complex farming system in Bangladesh (Kwon *et al.*, 2020). Backyard chickens are reared in free-ranging systems, and many households keep their chickens and ducks in the same property. They are more vulnerable to the HPAI (H5N1) virus infection, and they can transmit the virus to commercial poultry (Biswas *et al.*, 2009; Rahman *et al.*, 2018; Ali and Islam, 2021). Most of the time, traditional biosecurity concepts fail to prevent or minimize the infectious diseases prevailing in our country. Although the commercial poultry industries can maintain biosecurity measures in their farms with the highest standards, however, this is very difficult to implement and often unaffordable for backyard poultry farming, particularly in tropical and low-income countries, including Bangladesh. As a result, the low bio-security and poorly managed backyard poultry continuously carries infectious diseases without showing any clinical signs and acting as a potential source of infectious diseases in neighboring

commercial poultry (Biswas *et al.*, 2009; Khatun *et al.*, 2022; Ali *et al.*, 2020). Hence ‘Community biosecurity’, is a concept where traditional biosecurity practices are extended outside the farm premises to reduce the load of infectious diseases, including NDV and AIV.

## Materials and Methods

### Study area

The study was conducted at a commercial breeder poultry farm in Bogura, a northwest district of Bangladesh. The farm has 30 thousand breeder chickens with a previous record of avian influenza (H5N1) outbreaks. Five villages surround the farm within a one-kilometer radius.

### Community biosecurity approach in rural poultry

The experiment started with assessing all avian species in those five villages within a kilometer of the breeder farm. After appointing a poultry health worker, a daylong training on poultry health care was arranged for the villagers, who have at least 10 chickens. The household survey was conducted to assess the present status of scavenging poultry and identify the prevalence of diseases in those areas. Depending on disease prevalence, two vaccines were selected for the mass vaccination program during the project period. Newcastle disease and Fowl pox vaccines (LRI, Mohakhali, DLS) were given to all chickens three times a year, and representative samples were tested to observe the antibody level of ND vaccination. All dead birds were examined carefully to find out the cause of death. If any birds showed clinical signs of avian influenza or ND, all birds of that house were purchased and culled immediately (spot culling) providing the financial support of the commercial breeder farm. Proper cleaning and disinfecting of the

affected chicken house were done under the supervision of the health worker. Isolation of sick birds and proper disposal of dead birds are also practiced and monitored by the health worker.

### Community biosecurity approach in commercial breeding farm

Commercial breeder farms maintain the ideal biosecurity model for commercial poultry farms. The vaccination schedule covered all endemic diseases, including avian influenza. The level of antibody was monitored after vaccination in most of the diseases.

## Results and Discussion

A total of 4872 (four thousand eight hundred seventy-two) poultry was recorded during survey, and most of them were chicken (3464), duck (1322) and a small number of farmers reared pigeons (86). Adult birds mostly died with charitable symptoms like avian influenza and Newcastle disease, and chicks died due to chicken pox and diarrhea. The vaccine was not used by the farmers or any other authorities. In our survey, it showed that most rural poultry houses were unhygienic with poor ventilation and biosecurity. There were three small-scale commercial broiler poultry farms in these five villages, and aspergillosis and gout were the major health problems, according to the farmer's comments. The overall flock immunity against ND at the 3rd year was 90% in community level, where as in breeder farm it was 95% against ND in the selected area (Figure 1). After starting the health care program, mortality of poultry due to infectious disease reduced, and no mortality were reported due to ND and Fowl pox outbreaks in these five selected villages. Similar findings were also reported by Otte *et al.* (2012) and Msoffe *et al.* (2010). There were 16 avian influenza suspected samples

from village chickens that were tested in the National Reference Laboratory for Avian Influenza (NRL-AI), Savar, Dhaka, and 13 samples were confirmed as HPAI by rRT-PCR. Ten dead bird's samples from the commercial breeder flocks were also tested, but none of those samples were positive for HPAI by rRT-PCR. All live birds of 16 suspected AI flocks were purchased by the commercial farm's authority and culled immediately (spot culling) by maintaining all recommended procedures. After removal of affected flocks, the chicken house and adjacent areas were properly cleaned and disinfected with 5% povidone iodine. After the completion of the project, the native poultry population increased to 10267 (ten thousand two hundred sixty-seven), which was more than twice the initial population (Table 1). According to the farmer's comments, their own consumption and marketing of chicken also increased double. Msoffe *et al.* (2010) also reported similar findings when implementing poultry vaccines and biosecurity at the village level in Tanzania. Small-scale commercial poultry farms also increased from three to seven, which is also more than twice. Due to the availability of vaccines and healthcare facilities, farmers are encouraged to rear poultry and establish commercial farms. A similar comment was also described by Anne *et al.* (2012). Both community bird and breeder farm were saved from infectious diseases like a win-win situation.

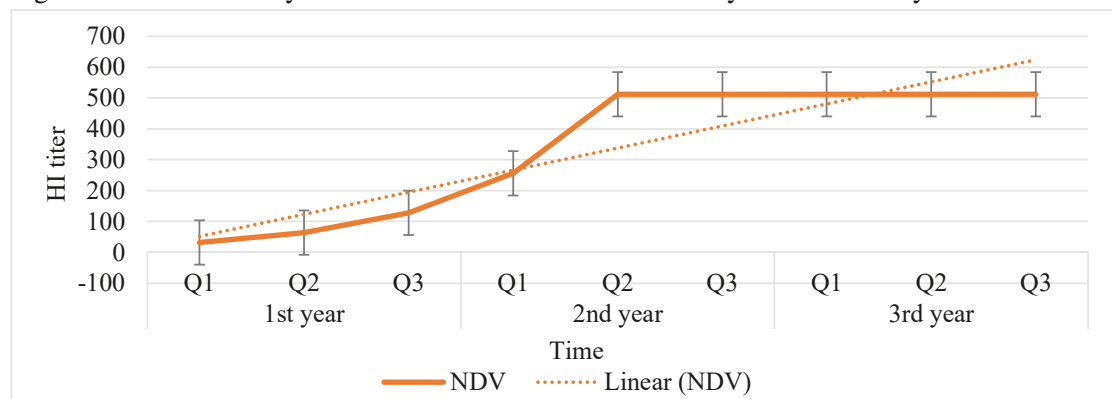
Table 1. Species-wise poultry population

Species	Number of populations	
	2013 (Starting time)	2017(Closing time)
Chicken	3,464	8,789
Duck	1,322	1,398
Pigeon	86	80
Total	4,872	10,267

Table 2. Morbidity and mortality status of common diseases of poultry species in the community before and after the start of the program.

Diseases	Species	Age of bird	Before start the program		After start the program	
			Morbidity	Mortality	Morbidity	Mortality
Newcastle Disease	Chicken	0-30 days	52%	32%	5%	1%
		> 1 month	41%	21%	4%	2%
Avian influenza	Chicken	All ages	77%	60%	0.5%	0.2%
Fowl pox	Chicken	>1 month to 6 months	43%	25%	3%	0.5%
Aspergillosis	Chicken	0-30 days	35%	22%	2%	0
		> 1 month	15%	7%	1%	0
Nonspecific diarrhea	All	All	26%	5%	6%	1.5%

Figure 1. Flock antibody status of ND of chickens in the study area for three years.



## Conclusion

Backyard chickens, due to their scavenging nature, are more vulnerable to infectious diseases, including avian influenza A/H5N1 virus infection. They are the probable reservoir host of avian influenza and can spread the infectious organism to neighboring commercial flocks. Community biosecurity was found effective in reducing the rate of infectious disease load, including

avian influenza in commercial poultry as well as household poultry.

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