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# Biosecurity Evaluation on Intensive Laying Hens' Farms in Albania – Assessing Practices and Recommendations for Disease Prevention

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**Abstract:** This study was funded by the National Agency for Scientific Research and Innovation (NASRI) in Albania, under the contracted project “Antimicrobial resistance in layers production chain: Risks and “One Health” approach implication”, a total of 5 laying hens’ intensive farms (with population ranging from 18,500 caps to 320,000 caps) were evaluated across one district, using structured questionnaires and on-site inspections. For data collection, two predesigned two check documents were prepared: a qualitative survey and a biosecurity questionnaire in accordance with laying hens survey by Biocheck ugent and one visit was applied in each of the selected farms. Results summarize the response of the veterinary technicians regarding the application of biosecurity measures in the establishments under investigation. The scoring system enables us for the first time in Albania, to quantify the applied biosecurity at herd level, considering all relevant aspects of biosecurity. At the same time, the scoring system can be used as a motivational and didactic tool for the farmer. The employed biosecurity measures were founded to be similar among the surveyed farms. These include cleaning between loadings, providing foot baths, and disinfecting vehicles that enter or restricting entry to a dirty area. The average internal biosecurity for the five laying hens’ establishments was 29 out of 33 points, compared with the average result of external biosecurity as 51 out of 67 point. This difference relies on major focus by the farms on the internal biosecurity measures neglecting the source of the infections coming from outside into the farm. However, this factor again highlights the risk of cross-contamination, which could be mitigated by better hygiene and disinfection practices, for which costs are limited.

**Keywords:** biosecurity; poultry farms; avian influenza; AMR.

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## 1. Introduction

In Albania, poultry farming is one of the most significant livestock industry sectors, contributing to the country's economic growth by creating employment opportunities and income for both rural and semi-urban populations. Albania has two principal poultry production systems: intensive or commercial poultry production, where birds are housed in absolute confinement, and small-scale or backyard poultry production, in predominantly rural areas. The Albanian poultry industry has a small but growing export base. At present, only class B – category eggs are eligible to be exported to

European member states. The major egg producing regions are located in central country with a high density in small areas thus contributing in similarities of poultry health status.

Biosecurity means limitation of transmission of infectious diseases between and within farms. Mainly, three biosecurity steps are defined: segregation, cleaning, and disinfection. Biosecurity evaluation aims to evaluate current biosecurity measures on poultry farms and assess their effectiveness in preventing disease outbreaks, which consequences are impactful on the farm health status and have a direct impact in the use of veterinary treatments accordingly with the infectious agent, resulting in the development of antimicrobial resistance. Moreover, the use of antimicrobials by the farmers without adhering to the correct dosing and withdrawal periods may lead to human exposure to antibiotic residues through the consumption of animal-sourced foods [187]. From around the change of the century, the use of antimicrobial treatments for control and prevention of infectious diseases in poultry has increased the incidence of antimicrobial resistance in several types of poultry breeding and among all the species [22], contributing to the spread of AMR strains up to the poultry products [13].

Unfortunately, this industry is recently facing also problems associated with avian influenza, due to the years of 2021 and 2022 epidemics. HPAI is concerned not only to birds but also to humans, as it poses a potential pandemic risk and has caused >800 human cases of H5N1 in the past five years [23]. Avian influenza is a highly virulent and contagious pathogen that can devastate flocks. One of the notable features of avian influenza is its ability to rapidly mutate, in addition to crossing the species barrier [2]. Avian influenza viruses are of major concern livestock, wildlife, and human health. In many countries in the world, including Albania, avian influenza viruses remain endemic in poultry, requiring improving biosecurity. Economies of scale and lack of productivity within the industry due to more than a half millions of dead laying hens during year 2022 have led to continued price, consumption increases of eggs and poultry meat.

Biosecurity practices are applied to limit the spread of infectious diseases' transmission within and between farms and are an important constituent of modern flock health programs 10. Biosecurity refers to the preventive measures designed to reduce the risk of transmission of infectious diseases on poultry farms. Biosecurity at a poultry farm includes all measures taken to minimize the risk of introduction and spread of disease agents and thus, includes all actions for keeping poultry and the farm healthy 9. Biosecurity application in poultry farms means measures or practices which limit or prevent the spread of many harmful pathogens onto or out of the farm. Inadequate biosecurity can contribute to creation of wide epidemics of highly pathogenic diseases such as avian influenza virus and development of antimicrobial resistance due to continuous treatment of the poultry against infectious diseases.

High levels of baseline deaths due to infectious diseases occurs because of poor disease control strategies and low or inadequate biosecurity measures [1]. It has been frequently observed that biosecurity practices on commercial poultry farms in Albania are insufficient. For example, visitors can often access commercial poultry farms without disinfecting their shoes, clothing, or equipment. The movement of farm workers was linked with the probability of farm infection [17]. In addition, wild birds can often enter poultry sheds, while wild and domestic animals frequently roam farm premises, and poultry waste is commonly left in the open 2. Improved biosecurity is indeed essential for reducing antimicrobial use, as demonstrated in studies like 7. By focusing on external biosecurity (preventing the introduction of pathogens) and internal biosecurity (limiting their spread), farms can significantly reduce the need for antimicrobials. This approach helps in maintaining healthier livestock and minimizing the development of antimicrobial resistance, which is a growing global concern.

The main diseases in the surveyed laying hens' farms, their occurrence, and control are summarized in Table 1. Diseases can present serious problems, particularly in high density laying hens growing areas, because of the high chicken population density and farm vicinity. Often there are improper or non-existent biosecurity procedures, lack of diagnostic laboratory services, under this situation, a good farm animal health program is essential, and applied biosecurity measures are crucial to prevent high contagious diseases and other infections which require antimicrobial

treatment. Intensive poultry growers, assure the quality of their chicks and provide them vaccination programs and private veterinary and diagnostic technical assistance. The training and awareness of the private technical assistance remains a weak point regarding proper biosecurity implementation in order to minimize the risk of farm contamination and horizontal speed of transmission of viral and antibiotic-resistant bacterial strains across the sector.

**Table 1.** Main poultry diseases and their control in the surveyed establishments.

Main Diseases	Occurrence	Control
New Castle, IBD, Marek, Infectious, Laringotracheitis	Endemic nation-wide in intensive and rural poultry breeding	Primarily by vaccination, but most of farmers neglect biosecurity.
Escherichia coli	Endemic nation-wide in intensive and rural poultry breeding	Antibiotic treatment, few integrators, biosecurity mostly neglected
Salmonella spp.	Endemic nation-wide in intensive and rural poultry breeding	Antibiotic treatment, few integrators, biosecurity mostly neglected
Mycoplasma spp.	Endemic nation-wide in intensive and rural poultry breeding	Antibiotic treatment, few integrators, biosecurity mostly neglected

Direct contact between animals is considered to be the main transmission route of infectious agents. Therefore, more attention will be paid to biosecurity measures which avoid direct contact between animals, than to measures taken to prevent indirect transmission through, for example, work material or persons [3].

## 2. Materials and Methods

A total of 5 poultry large farms (with population ranging from 18,500 caps to 320,000 caps) were evaluated across 1 region, as presented in Table 2, using structured questionnaires and on-site inspections. For data collection, two predesigned questionnaires were created, and one visit was applied for investigating the application of biosecurity measures in each of the selected farms. Results summarize the response of the veterinary technicians regarding the application of biosecurity measures in 5 intensive laying hens’ establishments under investigation. For this purpose, two check documents were prepared: a qualitative survey and a biosecurity questionnaire in accordance with laying hens survey by Biocheck.ugent.

The visits were placed from February to March 2023, several assessed factors were recorded during the visit as summarized in key parameters were hygiene protocols, farm access, animal movement, visitor control, daily cleaning schedules, disinfection stations, footbaths at entrances, poultry quarantine procedures, egg, water and feed management and waste disposal practices according Biocheck. Gent.BV.

External biosecurity focuses on the contact points of the farm with the outside world and aims to prevent that pathogens can enter or leave the farm. This applies both to exotic diseases, which occur rarely in a country, as well as to endemic diseases, which are common in a country but do not occur at every farm [19]. All measures taken to counteract the spread of pathogens within a farm are covered by internal biosecurity [16].

A distinction of 67 points was given to the control points of external biosecurity and 33 points for internal biosecurity, for a maximum total point score of 100 points for the correct implantation of

the biosecurity measures. Based on the field observations and analyzing of the respective point score of the biosecurity measures in the investigated intensive poultry establishments, we evaluated the farms and advised the Food Business Operators to improve the measures application in decreasing the recurrence of infectious diseases, use of antibiotics and or incidence of Avian influenza.

**Table 2.** General data of the 5 surveyed laying hen’s establishments.

Laying Hen establishments	Number of caps	Number of poultry units/barns	Employee	Start	Biosecurity plan	Feed supply	Refill of barns/units	Origin of pullets
No. 1	145,000	2	80	2010	yes	Own production	Day old chicks /	Greece Bulgaria
No. 2	70,000	2	35	2002	yes	Own production	all in, all’out	Greece Bulgaria
No. 3	18,500	1	11	1995	yes	Own production	Day old chicks /	Albania
No. 4	320,000	5	60	2000	yes	Own production	all in, all’out	Austria Poland
No. 5	150,000	3	35	2004	yes	Own production	105 days old/ all in, all’out	Netherlands, Hungaria
Total	703,500							

### 3. Results and Discussion

As presented in Table 3, the employed biosecurity measures were founded to be similar among the surveyed farms. These include cleaning between loadings, providing foot baths, and disinfecting vehicles that enter or restricting entry to a dirty area. Visitor access is from youngest to oldest age-group flock. Houses were usually not bird proof. Grow out houses were designed to fill-up at least one-layer house.

**Table 3.** Biosecurity quantitative assessment, for 5 poultry intensive establishments.

Laying hens establishments	External biosecurity 67 points	Internal biosecurity 33 points	TOTAL Points 100 points
No. 1	54	31	86 points
No. 2	54, 5	30, 5	84 points
No. 3	38, 5	23	61, 5 points
No. 4	57	29, 5	86, 5 points
No. 5	51	31	82 points
<b>Average</b>	<b>51 points</b>	<b>29 points</b>	<b>80 points</b>

The scoring system enables us for the first time in Albania, to quantify the applied biosecurity at herd level, considering all relevant aspects of biosecurity. At the same time, the scoring system can be used as a motivational and didactic tool for the farmer.

Burdens for correct biosecurity management are highlighted so the farmers may compare their results and the required control measures benchmark their situation. Different poultry farms can be easily compared to each other and each farm can be tracked over time when the same scoring system is used. If the biosecurity assessment system is used throughout the country, the level of biosecurity can be determined and areas of high risk for the spread of disease can be identified. This can be useful in case of outbreaks of epidemic diseases and enables surveillance depending on the target.

**Table 4.** The quantitative assessment of external biosecurity (maximum score 67 points / 100 points).

Laying hens establishments	Purchase of day-old chicks 9 points	Animal movement/ depopulation of the poultry houses 8 points	Transport of eggs 7 points	Feed and water points 8	Removal of manure and carcasses 14 points	Visitors and farmworkers 9 points	Material supply 1 point	Infrastructure and biological vectors 7 points	Location of the farm 4 points	TOTAL 67 points
No. 1	6.5	7	7	6.5	8	9	1	7	2	54 points
No. 2	6.5	7	7	6.5	8	9	1	7	2.5	54.5 points
No. 3	5	6	1	6.5	4	6.5	1	5.5	3	38.5 points
No. 4	7	8	7	8	9	9	1	6	2	57 points
No. 5	9	7	7	7	4	8	1	6	2	51 points

The external biosecurity results for 4 laying hen establishments (No.1, No.2, No.4 and No.5) with a capacity of production over 18,500 caps varied from levels of 54 up to 57 points, towards the required level of 67 points for correct application of biosecurity measures.

The farm with low poultry density (No. 3) resulted in an external biosecurity level of 38, 5 points out of 67 points, with weak score especially in the purchase of day-old chicks, transports of eggs, human and animal movement. This is mainly relied on infrastructure investment of medium size farms and access to finance for farm investment. As part of the infrastructural need of investment the Establishment Number 3, had to buy layer pullets from other farms, as there was no capacity for a separate day-old chick breeding unit. When layer pullets have been reared on other premises and were exposed to infection, they can become carriers of diseases not existing on the layer farm. This way, new pathogens can be introduced to the production site. Several studies have shown that introducing animals from different source herds increases the risk of disease introduction into the poultry farm [15].

Key transmission pathways for antimicrobial-resistant (AMR) strains and Avian Influenza viruses, can spread through human movement, vectors (such as wild birds, rodents, insects), and contaminated materials like farm equipment and delivery trucks. The study by [20], suggests that implementing measures like closing farm gates and using fit wire netting can reduce these transmission risks. Pets are also vectors which could transport contaminated material between locations as well as the possibility of cross-species transmission.

Never the less the low investment capacities Laying Hen Establishment Number three had the best score for farm location, as all the other poultry establishments resulted to be in vicinities of less

than 1 Km and moreover sharing the same transport road. This is contributed in the low score of the removal of manure and carcasses disposal evaluation in all of the surveyed poultry establishments with an average of 6.6 points out of 14 required. Poultry transport vehicles are constantly in contact with other farms and slaughterhouses. This creates a quite extensive risk for disease transmission [12].

**Table 5.** The quantitative evaluation of the internal biosecurity measures.

Laying hen establishments	Disease management 5 points	Cleaning and disinfection 12 points	Materials and measures between compartments 6 points	Egg management 10 points	TOTAL 33 points
No. 1	5	12	5	9	31
No. 2	4	12	4.5	9	29.5
No. 3	4	10	3	6	23
No. 4	4	12	3.5	10	29.5
No. 5	4	12	6	9	31

In general, the results of the internal biosecurity applied measures were higher than those of the external biosecurity. Vaccinating a susceptible poultry population is an important part of good disease management, together with removing the cadavers from the animal houses and controlling the stocking density [12]. But not all of the infection diseases in poultry can be prevented by vaccination. Another weak point of 3 laying hens’ establishment was the occurrence of avian influenza during the pandemic of year 2022. This was evaluated as a negative result in the biosecurity assessment of the present study. Somewhat less important yet significant factors promoting AIV risk were found to be not disinfecting farm equipment but the transport of manure and other materials in vehicles and roads shared with other farms.

The average internal biosecurity for the five laying hens’ establishments was 29 out of 33 points, compared with the average result of external biosecurity as 51 out of 67 point. This difference relies on major focus by the farms on the internal biosecurity measures neglecting the source of the infections coming from outside into the farm. However, this factor again highlights the risk of cross-contamination, which could be mitigated by better hygiene and disinfection practices, for which costs are limited.

**4. Conclusions**

The present study confirmed that biosecurity evaluation and continuous monitoring is considered as an indispensable tool to mitigate the spread of infectious diseases. The assessment of the collected data is an important step to perform a quantitative evaluation of applied biosecurity measures at the farm level. The location of the farms, the presence of infections and the management of the removal of manure and carcasses in poultry for piloted laying hens establishments are important and crucial elements in the preventing infections. According to the collected data, in all of the poultry establishments there is presence of various infectious diseases, which brings the need for treatment with veterinary medical products, mainly antibiotics. It could be concluded that application of biosecurity measures reduces the occurrence of diseases and the development of antimicrobial bacterial strains, due to recurrence of infectious diseases. Field information was collected by the project staff in collaboration with the relevant field poultry technical manager (veterinarian). This ensures that the analysis and quantitative processing of the data were not influenced by subjective and/or personal opinions.

**Conflicts of Interest:** The authors declare no conflict of interest.

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