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PRACTICES OF BIOSECURITY MEASURES AND THEIR CONSEQUENCES ON POULTRY FARMS IN ABIDJAN DISTRICT

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Abstract:
In Côte d'Ivoire, poultry farming is an important source of income for many people. However, the industry faces many health constraints that cause enormous economic losses. Since implementation of biosecurity measures is known to reduce the risk of disease transmission, the aim of this study is to analyze the biosecurity measures applied in poultry farms in Abidjan district. Therefore, 91 farms were investigated using a face-to-face interview-based questionnaire. The questionnaire consisted of question sets related to production characteristics and the biosecurity components. The results revealed that the majority of farms were broilers chicken (69.65 %) and laying hens (28.35%). Regarding isolation of farms, 45% had no physical barriers around the farms and in 41% of the farms visited, the presence of other farm animals was observed. Concerning sanitation, the biosecurity level was low for 98.5% of farms with only one cleaning process of poultry houses between two flocks. However, using disinfectants is implemented in all visited farms. The most frequently symptoms observed are loss of appetite, weakness, weight loss, respiratory problems, coughing, fever, and diarrhea. But in 79 % of cases many animal deaths were due to diarrheal diseases. The majority of farmers (89 %) use as soon as the first symptoms appear, various antibiotics like macrolides, Beta-Lactamines, tetracyclines, fluoroquinolones, aminosides and polymycines. The low implementation level of biosecurity measures and overuse of antibiotics in poultry farms suggests that government officials should monitor the issues of biosecurity and the use of antibiotics in this sector very seriously.

Keywords: *Poultry sector, Hygien practices, Biosecurity, Drugs overuse*

1. Introduction

Poultry farming is a key factor in the development of many nations, both for nutritional and economic reasons [1]. In Côte d'Ivoire, the poultry production sector accounts for nearly 5% of agricultural Gross domestic product (GPD) and 2% of total GPD [2]. In 2017, for example, total revenue was estimated at around US$48 million [3], corresponding to 44,000 tons of poultry meat and 36,000 tons of eggs. This covered 90% of the population's poultry meat needs and 100% of its egg needs. In addition, the Ivorian government intends to increase this performance by reaching 60,000 tons of poultry meat and more than 1.678 billion eggs/year in 2020 to fully cover the population's animal protein needs [3].

The poultry industry is made up of two sectors, traditional poultry farming and modern poultry farming. In the modern production system, breeders generally use imported breeds that have a very high productivity compared to local breeds, making the poultry sector very dynamic compared to the traditional production system in Côte d'Ivoire [3]. However, this sector faces many problems including various pathologies that lead to a significant drop in meat and egg production. The most common pathologies are Gumboro and Newcastle diseases,

salmonellosis, collibacillosis and avian coccidiosis [4]. The production loss caused by these diseases is estimated at 39.45%, corresponding to more than US$ 5.2 million [5]. The occurrence of these diseases is generally due to poor control of biosecurity measures [6]. During poultry production indeed, biosecurity measures help to prevent the introduction of pathogens into the farm (external biosecurity or bio-exclusion) and to prevent the spread of the disease to uninfected animals on the farm or to other farms where the pathogen is already present (internal biosecurity or bio-containment) [7]. These biosecurity measures include the application of hygiene rules in poultry farms and the implementation of preventive means such as vaccination [8]. Thus, the aim of this study is to analyze the biosecurity measures applied in poultry farms in Abidjan district. These data could contribute to a better understanding of the economic losses due to many diseases affecting animals during the rearing process, to improve sanitary conditions in poultry farms and reduce the use of antibiotics in this sector in our country.

2. Matherials and methods

Study area and farm selection criteria

The study was carried out from January to June 2018 on poultry farms located in district of Abidjan (in the south of Côte d'Ivoire). The subdivisions Bingerville, port-Bouet, Ayama and Yopougon were chosen due to the importance of poultry farming in these locations (figure 1). The district of Abidjan lies between longitude 4° 1' 59.999" W of the Greenwish meridian and latitude 5° 19' 0.001" N of the equator. This region is characterized by a typical humid tropical climate with temperature ranges between 22 ° C and 32 ° C and a precipitation evaluated to 787 mm and 1500 mm throughout the year [9].

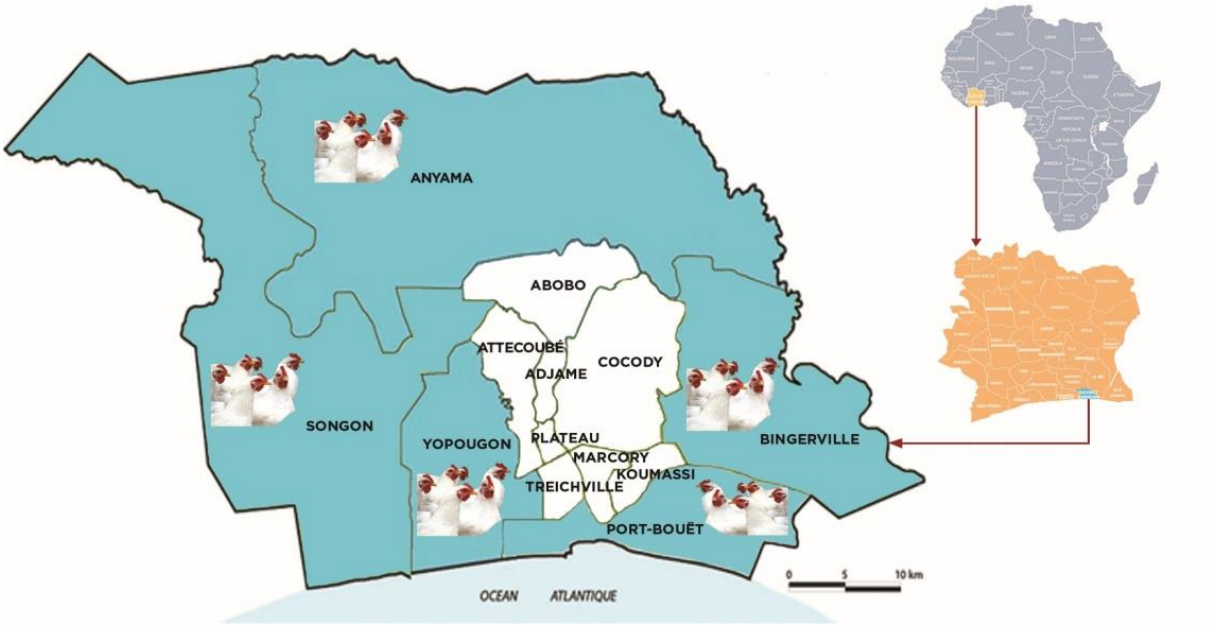

Fig 1. **Map of the district of Abidjan (in the south of Côte d'Ivoire) indicating the study area**

Questionnaire design and Selection of farms

The questionnaire consisted of question sets related to production characteristics (farm size, breed and production system, using of antibiotics among others) and biosecurity components (isolation and sanitation items). Questions were constructed based on the epidemiology of common chicken's diseases in Côte d'Ivoire.

The survey based on the formulated questionnaire was carried out through a face-to-face interview between the researcher and the farmers and personal observations of the researcher. Only farm's with at least 100 chicken heads were selected for the survey.

Determination of the adoption level of evaluated parameters by farmers

The adoption level of a given parameter was obtained by dividing the total number of farms applying that measure by the total number of visited farms. The ratio was expressed as a percentage.

3. Results and discussion

General characteristics of poultry husbandry from visited farms

A total of 91 poultry farms were visited during this survey. Of these farms, 27 were in Bingerville, 33 in Port-Bouet, 21 in Ayama and 10 were located in Yopougon. Generally, in all visited farms, the number of animals ranged from 150 to 2,000 heads. Moreover, broilers chicken and laying hens farming is the most developed with respectively in 69.65% and 28.35% of visited farms. These results are similar with finding of Bitty [10] that has showed that poultry production in Abidjan area is dominated by the breeding of broilers chicken. According to this author, increase of chicken meat consumption in this area would lead to the increase of broilers chicken breeding. Among the visited farms, only 35% are headed by farmers with basic certificate in poultry production system. Despite, only 5.4 % regularly use a veterinary service for animal health monitoring. This fact could lead to bad poultry breeding conditions, misdiagnosis in cases of diseases and therefore inadequate therapeutic treatment [11, 12].

Application of biosecurity measures

In general, the application of the biosecurity procedures is essential for the success of any type of animal production. Indeed, biosecurity measures reduce the risk of introducing pathogens during the poultry production processes [13] and then reduce financial losses [14]. In this study, we focused on two aspects of biosecurity during the poultry production process, namely farm isolation and on-farm hygiene practices.

The isolation of the farm

On 45% of the farms visited, no physical barriers were observed around the farms. However, 39.5% of the farms had a metal or plastic sheeting fence, while 15.5% had a real brick fence around the farm. The absence of a physical barrier such as real brick in most of the poultry farms visited could promote the free movement of rodents and wild birds, which are potential sources of contamination of chickens by various pathogenic microbes [15]. In addition, proximity between the different farms visited (within 100 meters) was observed in more than 98% of cases. Dosso [16] made the same observations in poultry farms in the Agnibilékro area. In 41% of the farms visited, the presence of other farm animals (pigs, rabbits, other poultry, etc.) and pets (dogs, cats) was observed. These animals could be microbial sources of contamination of chickens. Indeed, pigs are generally carriers of many pathogens such as Salmonella, E. coli, coccidia.

On the other hand, the proximity observed between farms could allow the spread of pathogenic microorganisms from one farm to another. Indeed, studies conducted in Denmark, Netherlands and Australia have shown a relationship between the risk of infection of chickens and the distance between farms respectively for Gumboro disease [17], H7N7 avian influenza [18] and Newcastle disease [19]. These authors indicated that the probability of occurrence of these infections decreased with increasing distance between farms. Vandekerchove et al. [20] also showed that the probability of colibacillosis decreased six-fold with a 1 km increase in distance between herds. Therefore, the proximity observed between the farms visited could explain the different pathologies affecting many farms and the huge economic losses estimated at more than US$ 5.2 millions per year in the poultry sector in Côte d'Ivoire [21- 23].

Hygiene practices on farms

In general, poultry are housed in a poultry house built with a concrete floor (100 %). This could be a major advantage that could facilitate the disinfection process [24]. Poultry farmers reported that cleaning of poultry houses is carried out once (98.5 %) or twice (1.5 %) between two flocks. The majority (64.71 %) of owners use a sodium hypochlorite solution for this disinfection. Some owners (31.51 %) also reported that they use other disinfectants such as lime, methylene blue and formaldehyde in addition to sodium hypochlorite solution. In all farms visited, farmers also indicated that they cleaned feeders at the same frequency. However, the use of detergents (such as sodium hypochlorite) during cleaning could help to maximize the removal of pathogenic flora that contaminates poultry houses. In addition, on most of the farms visited, farmers cleaned the water troughs daily, using simple water without detergent. This daily operation avoids the proliferation of pathogenic flora in the drinkers but is insufficient due to the absence of disinfectant.

Symptoms of poultry diseases and antibiotic treatment

More than 98% of farmers in the study area reported that the symptoms frequently encountered in cases of disease include loss of appetite, weakness, weight loss, respiratory problems, coughing, fever, diarrhea (**Figure 2**). Moreover, according to these farmers, the pathologies actually identified are fowl plague (7.69 %), Gumboro disease (9.89 %), cocidiosis (12.08 %) and infectious bronchitis (5.49 %). Thus, in the majority of cases (more than 64 %), the causes of these symptoms remain unknown or are not investigated. It should also be noted that 79 % of farmers indicated that many animal deaths were due to diarrheal diseases. According to the farmers surveyed, losses due to these diseases can range between 5 and 100 % of the animals.

Since the late 1970s, the poultry sector has witnessed the emergence or re-emergence of at least one infectious disease every year on average [25]. According to Barnes et al. [26], these diseases can be divided into two classes, namely production diseases affecting animal performance and classical pathologies. Production diseases can be responsible for growth retardation and, in severe cases, can lead to the death of the majority of the flock within a few days.

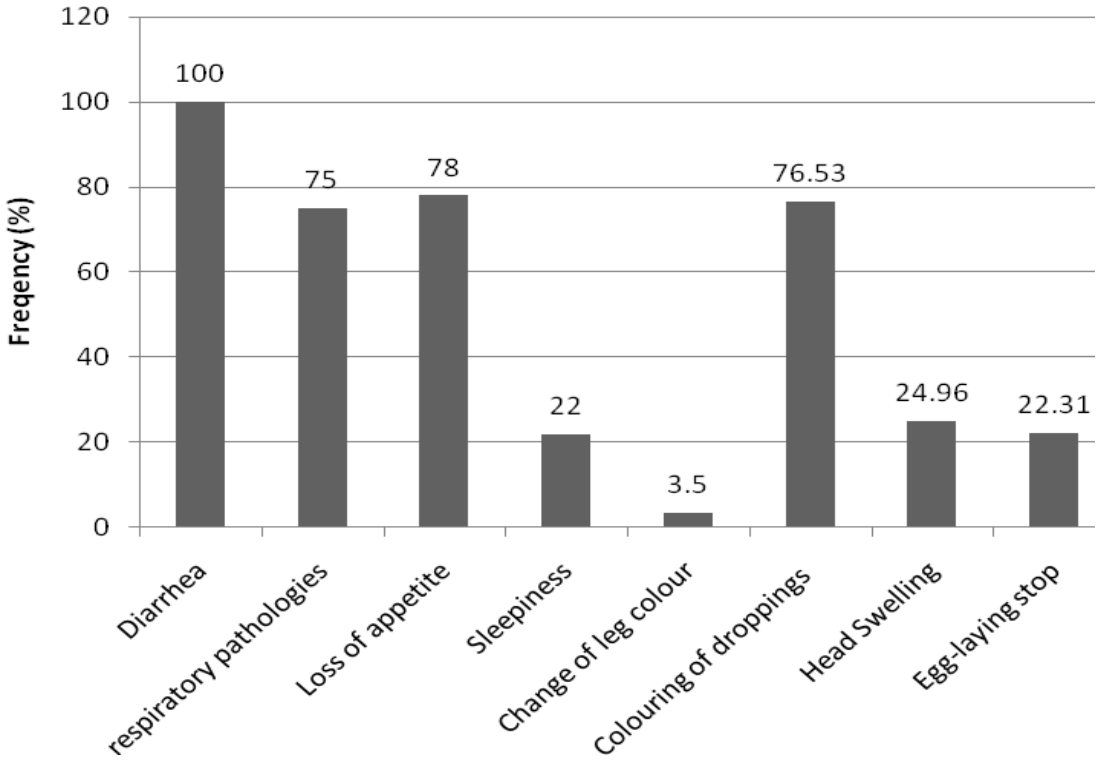

Fig 2. Symptoms reported by Abidjan disctrict poultry farmers

The occurrence of production diseases is generally due to a lack of biosecurity measures on farms [27]. Indeed, the problem seems to have become more alarming in recent decades; the prevalence of these diseases is increasing, particularly on modern farms. To overcome these problems, farmers are turning to the overuse of antibiotics.

In our survey, the majority of farmers surveyed (89 %) indicated that, as soon as the first symptoms appear, various antibiotics are used (Table 1) in order to better cover many types of pathologies. These drugs are most often used in combination (71.42 %) in order to increase their effectiveness. These combinations generally include Tylosin combined with Tetracyclines and/or Amoxiciline-Clavulanic Acid, Colistin and Streptomycin. These antibiotics would be used prophylactically (in 100 % of the farms visited), although antibiotics such as tylosin and enrofloxacin are well known to be growth promoters.The use of several families of antibiotics is probably responsible for the emergence of bacterial strains resistant to these and other antibiotics of these families in the poultry industry in Côte d'Ivoire [28, 29]. Indeed, several studies have shown that the increase in antibiotic-resistant bacterial strains could be linked to selection pressure for these strains resulting from the uncontrolled use of antibiotics in the livestock sector [30 - 32]. In addition, some families of identified antibiotics are also used in human medicine, suggesting a risk of therapeutic failure in the treatment of human bacterial infections [33]. It is therefore necessary to seek new approaches to limit the use of antibiotics in poultry farming. Furthermore, according to the survey data, 85.41% of the farmers surveyed generally purchase these drugs without a prescription from a veterinarian,

while only 14.59 % of poultry farmers always seek the services of a veterinarian before using antibiotics. These data confirm the absence of a system for monitoring the supply and use of antibiotics in semi-industrial poultry farms in Côte d'Ivoire, as previously observed by Ouattara et al. [34].

Table 1:

Antibiotics used in the farms visited

Drugs use in visited farms	Antibiotic family	Frequency (%)
Tylosin	Macrolide	26.37
Amoxicillin-Clavulanic acid	Beta-Lactamine	2.11
Association of Amoxicillin-Colistin	Beta-Lactam and Polymycin	3.29
Tetracyclin	Tetracyclines	20.87
Flumequin	quinolones	5.49
Enrofloxacin	Fluoroquinolones	8.79
Streptomycin	Aminosides	12.08
Oxytetracyclin	Tetracyclines	18.68
Association of Oxytetracyclin-Doxycline	Tetracyclines	6.59
Gentamycin	Aminosides	3.29
Association of Gentamycin-Doxycline	Aminosides and Tetracyclines	6.59
Colistin	Polymycin	8.79

4. Conclusion

In conclusion, the low implementation level of BM suggests that farmers still have a long way to go and that government officials should handle the issue of biosecurity in poultry farming sectors very seriously. Moreover, the overuse of antibiotics could lead to the increase in antibiotic-resistant bacterial flora. Therefore, it is necessary to seek new approaches to limit the use of antibiotics in poultry farming.

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