Bacteriological Study of the Fishmeal used in Feed for Imported Chicken in Atlantic Department

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Abstract: Bacteria are microorganisms involved in the digestion of foods by many animals. At the same time, some of them are pathogens causing serious diseases to the survival of animals that harbor them. It is therefore essential to identify the different species of bacteria in feed served to farm animals. The present study aims at identifying the bacteria in the fishmeal used for feeding imported chickens in Atlantic Department. Out of sixty-one (61) samples collected, twenty six (26) came from provender sites, sixteen (16) from wholesaling importers and nineteen (19) from imported chicken breeds. A total of twelve types of bacteria were identified: Staphylococcus, Klebsiella, Serratia spp, Actinomyces piogenes, Erysipelothrix spp, Citrobacter spp, Escherichia coli, Lysteria spp, Levinea spp, Salmonella spp, Bacillus spp, Providencia spp. Ten out of them, namely Staphylococcus spp, Klebsiella spp, Serratia spp, Actinomyces piogenes; Erysipelothrix spp, Escherichia coli, Levinea spp, Bacillus spp, Lysteria spp, Providencia spp were isolated from provender and five (5) bacteria: Staphylococcus spp, Klebsiella spp, Actinomyces piogenes; Lysteria spp; Levinea spp were found in fishmeal from wholesalers. Regarding the poultry farms, seven (7) bacteria out of twelve, Staphylococcus spp, Actinomyces piogenes, Citrobacter spp, Escherichia coli, Klebsiella spp, Levinea spp and Providencia spp were isolated from fishmeal. As for the two varieties of fishmeal used, it is clear that Klebsiella spp was more present in the Extra variety at a rate of 27.27%. On the other hand, the Valcru variety was contaminated with Staphylococcus spp at a rate of 18.18%. Therefore, it is essential to take into consideration hygienic measures.

Key words: Bacteria, feed, fishmeal, imported chickens

INTRODUCTION

In most African countries activities concerning poultry represent a significant part of the rural economy particularly and of the national economy as a whole (Ouandaogo, 1990; Diambra, 1990; Kulube, 1990; Sonaiya, 1990). Although enhanced in West Africa the first and second decades after independence, intensive poultry production has not yet blossomed (Adeyeye, 1990). The real problem appears to be the unsustainable nature of intensive poultry production systems developed in the post-independence period. This non-sustainability is due to technical, biological, institutional and socio-economic problems.

In Benin Republic as in the rest of West African countries, poultry breeding has considerably evolved over the last ten years. There was a number of 800,000 livestock (laying hens, chickens, broiler fowls) in 2003
Gram+. The incubation was carried out for 24 h to isolate medium and the identification of Micrococcaceae Gram-negative bacteria (GRAM-). After thorough examination at cool condition and staining of GRAM, the bacteria were cultured on agar Chapman. It was a selective medium for isolation and identification of Micrococcaceae, including *Staphylococcus aureus*. The bacteria were also cultured on agar nutrient. Biochemical characteristics (catalase, haemolysis, urease, indole, DNase, fermentation of glucose, lactose, mannitol) and mobility properties were used to identify the different species of bacteria present in the fishmeal.

**Statistical analysis:** Z-test of Fischer for comparison values was used. The test intended to compare two amounts or percentages from two independent populations to determine which was statistically higher (or lower) or equal. The null hypothesis test was $H_0: p_1 = p_2 = p$, or $H_0: p_1 - p_2 = 0$ and the alternative hypothesis was $H_1: p_1 > p_2$ or $H_1: p_1 - p_2 > 0$. It was a test of homogeneity of two frequencies (or proportions). The formula used was:

$$Z_a = (p_1 - p_2)/\sqrt{(p(1-p)/n_1) + (p(1-p)/n_2)}$$

where $p_1$ is the proportion in the first population, $p_2$ that of the second population, $p$ the average frequency of both populations, $n_1$ the number of the first population and $n_2$ that of the second population.

**RESULTS**

**Content and frequency of pathogenic bacteria isolated in the samples:** The results are shown on Table 1. In respect of samples from wholesalers, the highest frequency 43.33% was recorded with Klebsiella spp and the lowest frequency 0% was recorded with *Serratia* spp, *Erysipelothrix* spp, *Citrobacter* spp, *Escherichia coli*, *Salmonella* spp and *Bacillus* spp. Regarding the provender site, the highest frequency was 31.71% with *Actinomyces pyogenes* and the lowest frequency of 0% was obtained with *Citrobacter* spp and *Providencia* spp. Finally, for poultry farming, *Staphylococcus* spp had the highest frequency about 33.33%. The lowest frequencies (0%) were obtained with *Serratia* spp, *Erysipelothrix* spp, *Listeria* spp, *Salmonella* spp, *Bacillus* spp.

The results showed significant difference at 5% among provender sites, poultry farming and wholesalers for *Staphylococcus* spp and *Listeria* spp on one hand. On the other hand, there was a statistically significant difference between provender sites and wholesalers for *Actinomyces pyogenes*. However, there was no significant difference between the frequencies from provender sites and wholesalers for *Staphylococcus* spp and *Listeria* spp. The comparison between values from provender sites and poultry farming for *Klebsiella* spp, and those from Wholesalers and poultry farming for *Serratia* spp, *Erysipelothrix* spp showed no significant difference. Similarly, there was no statistically significant difference

**MATERIALS AND METHODS**

**Materials:** The present investigation was carried out during September and October 2010 in Zou and Collins department located in the central part of Benin. Two varieties of fishmeal, namely Extra-fishmeal and Valcru-fishmeal imported from Dakar, Senegal and sterile bags were used to collect samples from 16 wholesalers, 26 provender sites and 19 poultry farming. The wrapped and labeled samples were stored in a refrigerator at +4ºC to be used the next day. Dehydrated media purchased from the “Pasteur Institut Production” made in France were used as media culture.

**Sampling and labeling of bacteria:** Two hundred grams of fishmeal samples were collected from 16 wholesalers, provender sites and poultry farming into sterile bags. To make the sampling representative, the fishmeal was collected from three different levels of the bags (top, middle and bottom). They were labeled and transported to the Microbiology laboratory for bacteria analyses. The isolation and identification of pathogenic bacteria were conducted at the Veterinary Laboratory in Bohicon (Labovet, BP 2069, Abomey, Benin Republic) using the method of Chantal (1973). The bacteriological analysis of fishmeal was centered on the search of germs on selective medium and the identification of Micrococcaceae Gram-negative bacteria (Gram-) and Gram-positive bacteria) Gram+. The incubation was carried out for 24 h to isolate and identify Gram+. It was then followed by enrichment on selenite stock to isolate Enterobacteriaceae Gram-negative bacteria (GRAM-). For proper monitoring of poultry, it is imperative to investigate the bacterial flora present in fishmeal that represents the nutritional diet of imported chickens. Therefore the present research was carried out to investigate the bacteria contaminating the fishmeal used for feeding chickens imported in Atlantic department.
The trend from the comparison between the frequencies of bacteria isolated from the two types of fishmeal using Z-test:

Table 2. For Extra-fishmeal, the highest frequency 27.27% was obtained with Klebsiella spp, followed by Bacillus spp and Providencia spp. It was 25.81% and represents the highest frequency of Salmonella spp, followed by Staphylococcus spp, Erysipelothrix spp, Bacillus spp and Providencia spp. In respect of Valcry-fishmeal, the lowest frequency (0%) was obtained with Klebsiella spp, Serratia spp, Actinomyces piogenes spp, Bacillus spp and Providencia spp. The lowest frequency (0%) was obtained with Klebsiella spp. In respect of Valcry-fishmeal, the frequency of Staphylococcus spp was similar to that of Klebsiella spp. It was 25.81% and represents the highest value. The lowest (0%) was obtained with Erysipelothrix spp and Salmonella spp. However, statistic test at 5% showed no significant difference between these values from the two types of fishmeal.

**DISCUSSION**

The study was based on a bacteriological analysis of different types of fishmeal used in Atlantic Department to feed imported chickens. Five bacteria out of twelve commonly recorded were observed in fishmeal obtained from wholesalers. This result could be explained by the contamination of fishmeal at the origin or alternatively during transport or in the storage site after the purchase. According to Chantal (1973), the microbiology of aquatic environment determines significantly that of fish. Therefore, fishmeal would have been contaminated if the fish used in its making had been infected. In addition, the manufacturing conditions of fishmeal could increase the rate of contamination of the final product. It should be noticed that fishmeal was imported from Dakar (Senegal) where many manufacturers do not have the suitable industrial equipment to produce fishmeal exempt of harmful pathogens. Moreover, the pursuit of maximum profit through the purchase of raw materials at low price leads importers in Benin to buy fishmeal whose microbiological quality is doubtful. Above all, warehouse or storage of fish used could increase the amount of germs of the final product. Indeed it is in precarious and unhealthy places which do not meet hygienic and health standards that storage for fishmeal is to be found. In such cases, the risks of contamination are high especially when fishmeal is poorly sterilized and preserved (Bodin et al., 2012).
1965; Guillaume et al., 1999). Pilet et al. (1983) explained that the contamination of food can be observed along the food chain including producers, processors, distributors and consumers. The presence of ten out of twelve bacteria in provender sites poses the problem of environmental conditions as a result of proliferation and spread of germs. The collective provender sites are places where many farmers come to buy feed where the exchange of microbes associated with avian diseases is promoted. It is also easy to notice that some of collective provender sites do not provide hygienic conditions such as a foot soak outside the building areas. Periodic disinfection is almost nonexistent in the practice of food sellers. These bad practices of food preservation for breeding contrast with the recommendations of Jourdain (1990) which stipulate that "breeding is nothing but hygiene".

With respect to poultry farming, the identification of seven different pathogenic bacteria out of a total of twelve could be explained either by the contamination that often occurs during the transport of food or lack of care during the various samplings leading to their usage or both factors. Polluted breeding materials associated with a poorly hygienic preparation of food on the ground could also contribute to the dissemination of germs affecting the quality of fishmeal. In many cases, raw materials used in the composition of food rations were stored directly on the ground, sometimes near feces of chickens which were kept in conditions that promote the spread and proliferation of microbes. Adeyeye (1990), Kulube (1990) and Aliou (2001) associated some of these aspects with poor farming practices.

The two types of fishmeal used in poultry areas in the Republic of Benin contain microbial germs: 9 types germs out of 12 from Extra-fishmeal and 10 out of 12 types from Valcru- fishmeal. The large number of microorganisms isolated and identified from different types of fishmeal could explain the emergence of various diseases such as fowl flu, fowl pest, etc. often recorded in poultry breeding centers and are responsible for significant economic losses through high mortality. Poultry farmers, faced with this situation, and in total absence of diagnostic laboratory, completely ignorant of the risks, still use antibiotics which were the main cause of poultry diseases. It should be noticed that no criterion for bacteriological analysis was taken into consideration by government-controlled institutions responsible for ensuring the promotion of poultry activities. These observations confirm the findings of Adeyeye (1990), Kulube (1990), Ngoupayou(1990), Sonaiya (1989, 1990) and Chrysostome and Allard (1997) who pointed out that the difficulties of breeding poultry in Africa and particularly in Benin were mainly due to poor control of hygienic and sanitary aspects of raw materials used to feed chickens.

The high frequencies of bacteria such as Klebsiella spp, Actinomyces piogenes, Staphylococcus spp and to a lesser extent for others such as Listeria spp, Levine spp, Erysipelothrix spp, Providencia spp, Citrobacter spp, Salmonella spp and Bacillus spp in both types of fish meal constitute evidence in favor of questionable microbiological quality of some raw materials used for poultry feed in Atlantic Department. The absence or insufficiency of an appropriate program of training in poultry farming in this Department as in other parts of Benin Republic, where poultry has increased over the last ten years, is one of the factors causing the spread of microbial agents. The health and hygiene standards are virtually nonexistent; unfortunately we cannot avoid high risk of losses owing to dissemination and contamination. The setting up of aviculture in Benin is not subjected to authorization by the officials in charge of promoting farming. The modern poultry farms, regarded as a secondary activity are practiced by the majority of farmers without a minimum of basic knowledge in the field. The absence of organizations to plan the distribution of the rations for poultry gives the occasion for the excessive use of feed of questionable quality. In addition, as the major concern for farmers is feeding the poultries, nutritional and bacteriological control of fishmeal are neglected.

CONCLUSION

This study allowed us to analyze the bacteriological status of the different types of fishmeal used for feeding imported poultry in Atlantic Department. Our study indicates that fishmeal from provender sites are more contaminated with a large number of several microbial species: Staphylococcus spp, Klebsiella spp, Serratia spp, Actinomyces piogenes, Erysipelothrix spp, Escherichia coli, Levine spp, Salmonella spp and Bacillus spp. It should also be pointed out that among the imported fishmeal for poultry farming Valcru type was more contaminated than Extra type. It is then imperative to initiate a collaborative program involving the government and all stakeholders in aviculture which complies with health and hygiene standards of fishmeal.

REFERENCES


