

## Microbiological Analyses of Poultry Feeds Sold in Umuahia Main Market, Abia State, Nigeria

C.N. Obi and I.J. Ozugbo

Department of Microbiology, Michael Okpara University of Agriculture, Umudike,  
P.M.B. 7267, Umuahia, Abia State, Nigeria

**Abstract:** Four brands of commercial poultry feeds (Vital, Top, Pfizer and Guinea) were subjected to microbiological analysis. Each of the four brands had four feed types namely Starters, Growers, layers and finishers feed. All these samples were analyzed by plating unto nutrient, Mc conkey and Potato Dextrose agars. Bacteria isolated from the samples are *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Erwinia* sp., *Enterobacter aerogenes*, *Micrococcus* sp. and *Escherichia coil* while the fungal isolate were *Penicillium* sp., *Rhizopus*, *Aspergillus* and *Cladosporium* sp. The bacterial load of the feeds was in the range  $1.13 \times 10^8$ - $3.0 \times 10^7$  with the Top Feed giving the highest number of bacterial contamination. Guinea, Vital and Pfizer feeds had the lowest number of contamination. The feeds were found to be contaminated and could pose potential health problems to the birds and humans.

**Key words:** Birds, contamination, poultry feeds

### INTRODUCTION

Poultry feeds are food materials used in raising poultry birds. In Nigeria, the word poultry is gradually becoming synonymous with chickens, but in actual fact, poultry includes all domesticated birds that can be used as a source of egg or meat production for our consumption. Such birds are chickens, turkeys, ducks and guinea fowl which are more acceptable to Nigerians than pea fowl, quail and pigeons among domesticated fowls quite popular in the Western nations. Poultry feeds are referred to as complete feeds as they are designed to contain all the nutritional materials needed for proper growth, meat and egg production in birds. Various brands of poultry feeds are in existence depending on the functions they perform in the birds. Thus, there are growers, finishers, layers, starters among others. Recently, nutritional factors and antibiotics such as bacitracin, tetracycline, oxytetracycline, chlorotetracycline have been incorporated into poultry feed formulations usually at low (prophylactic) level to prevent minor diseases and enhance efficient growth<sup>[1]</sup>.

The raising of poultry birds on commercial level requires large scale use of commercially prepared poultry feeds so as to satisfy the teeming population of humans that depend to great extent on the poultry by-products as their source of protein<sup>[2]</sup>.

Commercial production of poultry feeds poses huge financial problems to the subsistence poultry farmers. Consequently, raising of poultry birds at commercial level continues to elude the local farmers as procurement of the feeds at the desired quantity is not a made-easy task. Interestingly, poultry feeds have been implicated in several poultry diseases with varied pathological manifestations. These diseases are of viral (e.g., avian influenza, newcastle disease), bacterial (e.g., salmonellosis, infectious coryza) and fungal origins<sup>[3]</sup>. The involvement of poultry feeds in the transmission of aflatoxicosis which is the most prevalent and economically significant mycotoxin is of great health concern to the poultry farmers and the extended consumers<sup>[3]</sup>. Aflatoxins are known to be present in poultry eggs and human diseases like Traveller's Diarrhoea and Salmonella Para-typhoid Fever have been associated with the consumption of poultry birds that contracted the infections from contaminated poultry feeds.

The production of poultry feeds for local and commercial farmers in the developing countries including Nigeria requires above average microbiological safety regulations to escape microbial contamination of the product. Thus, the current study carried out in 2005 in Umuahia, Abia State, Nigeria aimed at the microbiological assessment of the various brands of poultry feeds sold in Umuahia Main Market, Abia State, Nigeria.

**MATERIALS AND METHODS**

The poultry feeds used in this study were analyzed on weekly basis for four weeks. They were purchased from the market retailers in Umuahia Main Market and aseptically collected from opened and unopened poultry feed bags using sterile 250 mL beakers and transferred into sterile universal bottles. The samples were labeled properly and taken immediately to the laboratory of National Root Crops Research Institute, Umudike where the samples were analyzed. Laboratory coats, nose masks and sterile hand gloves were worn during the time of sample collection. The samples were analyzed within 2-6 h of collection. Four types of feeds namely Starter (S), Growers (G), Layers (L) and Finishers (F) were collected for each brand of feed thus corresponding to 16 samples. The samples were coded thus: Vs, Vg, Vl and Vf for vital feeds (starters, growers, layers and finishers, respectively). The rest are Ps, Pg, Pl and Pf for Pfizer feeds; Ts, Tg, Tl and Tf for Top feeds and Gs, Gg, Gl and Gf for guinea feeds.

**Isolation and identification of bacteria:** Ten-fold serial dilution was carried out using sterile peptone water and 0.1 mL of the appropriate dilutions was cultured by spread plate technique onto Nutrient, McConkey and Methylene blue Agars, respectively. These were prepared the previous day<sup>[4]</sup>. The plating was carried out in duplicates and the inoculated plated were incubated at 37°C for 24-48 h. Colonial morphologies were recorded followed by sub-culturing of the isolates to obtain pure cultures that were grown on Nutrient Agar for 24 h and later stored in

the freezer for future use. Colony counts and further identification of isolates were carried out according to Ogbulie *et al.*<sup>[5]</sup>.

**Isolation and identification of fungal isolates:** Isolation of the fungi present in the samples was carried out using potato Dextrose and Sabourand Dextrose Agars. Following a 10-fold serial dilution of the samples, 0.1 mL of the appropriate dilutions was spread-plated onto the media using sterile bent glass rod. The media were fortified with 0.005% Chloramphenicol antibiotic to inhibit possible bacterial contaminants. The plates were inoculated in duplicates and incubated at 22°C for 2-6 days. Identification and characterization of the isolates were based on morphological features, slide culture technique and slide mount of each fungal isolate in lactophenol-cotton blue as described by Ogbulie *et al.*<sup>[5]</sup>, Barnett and Hunter<sup>[6]</sup>.

**RESULTS**

A total of nine bacterial and five fungal genera were isolated from the 64 samples analyzed in the work. Table 1 shows the percentage occurrence of the bacterial isolates in the four feed brands analyzed (vital, pfizer, top and guinea feeds) together with their types (starter, growers, layers and finishers) while Table 2 shows the bacterial counts in CFU mL<sup>-1</sup> of the various feeds samples. *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Proteus vulgaris* and *Micrococcus* sp. had 100% occurrence level in the four feed types with occasional occurrence of *Escherichia*

Table 1: Percentage occurrence of bacteria isolates from different brands feed samples

Isolate sample	<i>Staphylococcus aureus</i>	<i>Bacillus subtilis</i>	<i>Pseudomonas aeruginosa</i>	<i>Proteus vulgaris</i>	<i>Escherichia coli</i>	<i>Micrococcus</i> sp.	<i>Enterobacter aerogenes</i>	<i>Serratia marcescenes</i>	<i>Erwinia</i> sp.
1 A	+	+	+	+	-	+	+	-	-
B	+	+	+	+	-	+	-	-	+
C	+	+	+	+	-	+	-	+	+
D	+	+	+	+	-	+	-	-	-
2 A	+	+	+	+	-	+	-	-	-
B	+	+	+	+	+	+	+	+	-
C	+	+	+	+	-	+	+	-	-
D	+	+	+	+	-	+	-	-	-
3 A	+	+	+	+	-	+	+	-	-
B	+	+	+	+	-	+	-	-	+
C	+	+	+	+	-	+	-	+	+
D	+	+	+	+	-	+	-	+	-
4 A	+	+	+	+	-	+	-	+	-
B	+	+	+	+	-	+	-	-	+
C	+	+	+	+	+	+	+	-	+
D	+	+	+	+	-	+	-	-	-
% occurrence	100%	100%	100%	100%	12.50%	100%	25.00%	31.31%	37.50%

Key: 1-vital, 2-pfizer, 3-top, 4-guinea, A-starter, B-grower, C-layers, D-finisher

Table 2: Bacteria loads of different poultry feeds

A <sub>1</sub>	3.0×10 <sup>8</sup>
B <sub>1</sub>	1.6×10 <sup>8</sup>
C <sub>1</sub>	1.26×10 <sup>8</sup>
D <sub>1</sub>	1.53×10 <sup>8</sup>
A <sub>2</sub>	1.4×10 <sup>8</sup>
B <sub>2</sub>	1.77×10 <sup>8</sup>
C <sub>2</sub>	1.33×10 <sup>8</sup>
D <sub>2</sub>	1.53×10 <sup>8</sup>
A <sub>3</sub>	1.17×10 <sup>8</sup>
B <sub>3</sub>	1.40×10 <sup>8</sup>
C <sub>3</sub>	1.40×10 <sup>8</sup>
C <sub>3</sub>	1.67×10 <sup>8</sup>
A <sub>4</sub>	1.13×10 <sup>8</sup>
B <sub>4</sub>	1.60×10 <sup>8</sup>
C <sub>4</sub>	1.23×10 <sup>8</sup>
D <sub>4</sub>	1.67×10 <sup>8</sup>

Key = A1-Vital starter, A3-Top starter, B1-Vital grower, B3-Top grower, C1-Vital layer, C3-Top layer, D1-Vital finisher, D3-Top finisher, A2-Pfizer starter, A4-Guinea starter, B2-Pfizer grower, B4-Guinea grower, C2-Pfizer layer, C4-Guinea layer, D2-Pfizer finisher, D4-Guinea finisher

Table 3: Percentage occurrence of fungal isolates from different brands of poultry feeds

Isolute sample	<i>Aspergillus</i> sp.	<i>Penicillin</i> sp.	<i>Cladosporium</i> sp.	<i>Rhizopus</i> sp.	<i>Mucor</i> sp.
1 A	+	+	-	+	+
B	+	+	+	+	-
C	+	+	+	+	-
D	+	+	+	-	-
2 A	+	+	-	-	-
B	+	+	-	-	+
C	+	+	+	+	+
D	+	+	+	+	-
3 A	+	+	-	+	-
B	+	+	+	+	-
C	+	+	+	+	-
D	+	+	+	-	+
4 A	+	+	+	-	-
B	+	+	+	+	-
C	+	+	+	+	+
D	+	+	+	+	-
% occurrence	100%	100%	75%	8.75%	31.3%

Key: 1. Vital feed, 2. Pfizer, 3. Top, 4. Guinea, A. Starter, B. Grower, C. layers, D. Finisher

*coli*, *Enterobacter aerogenes*, *Serratia marcescenes* and *Erwinia* sp. Results showed that *Aspergillus* and *Penicillium* sp. had 100% occurrence level in the four feed brands with relatively high occurrence levels of *Cladosporium*, *Rhizopus* and *Mucor* species Table 3. In relation to the bacterial loads of the feed samples in CFU mL<sup>-1</sup>, Vital (Starter) feed had the highest bacterial load of 3.0×10<sup>8</sup> while Guinea (Starter) had the lowest bacterial load of 1.17×10<sup>8</sup> Table 1.

## DISCUSSION

The fore going microbiological analyses of poultry feeds in Umuahia market showed the presence of pathogenic bacteria like staphylococcus, *E. coli*, *Bacillus*, *Pseudomonas*, *Proteus*, *Micrococcus*, *Serratia*, *Erwinia* and Fungi: aspergillus sp., Penicillin. The presence of *Aspergillus* in the feed samples is of great health and

economic importance due to mits involvement in the production of aflatoxins which are powerful mycotoxins that have been found to be carcinogenic, teratogenic and mutagenic in humans and birds<sup>[7]</sup>. Aflatoxins were discovered in 1960 when 100,000 Turkey poultts died from eating.

Fungus-infected peanut meal. The toxins are known to cause frame-shift mutation<sup>[7]</sup>. Aflatoxins have also been found in cow milk following the consumption of contaminated cow feeds. In lactating animals, Aflatoxin B<sub>1</sub> and B<sub>2</sub> are modified in their bodies to yield Aflatoxins M<sub>1</sub> and M<sub>2</sub>. Aflatoxins are also potent hepatocarcinogens and have been liked to effects on immunocompetence, growth and disease resistance in livestock and laboratory animals. Its presence in poultry feeds could also mean their presence in poultry meats and eggs.

The presence of the above bacteria and fungi in all the feed samples calls for attention in the storage strategies employed by the poultry feed manufacturers, the ware house condition, distributors and the sellers. The opened bags of feed should be kept in glass-framed show cases to prevent house flies and dust particles gaining access to the exposed feeds. The poultry farmers on their side must ensure proper disposal of poultry droppings and contaminated feeds transmission of pathogens from the animal droppings to the feeds.

As a remedy, Poultry feeds should be stored in dry atmospheric environment to prevent the development of moulds. Furthermore, absolute quality control measures should be mounted in the poultry producing industries to ensure that raw materials such as oilseeds, groundnut cakes, cotton seeds, maize and brewery spent grains used in preparing Poultry feeds are free from microbial contamination.

The presence of *E. coli* suggests faecal contamination most probably from the product retailers while the presence of *Staphylococcus*, *Pseudomonas* and *Proteus* sp. in the feeds suggests recent contamination most probably from the market sellers. This is because these three organisms are non-spore formers and there presence in such samples like poultry feeds that are of very low water activity suggests recent contamination especially as the sellers and buyers have a feel of the texture of the feeds with bare hands thus exposing the feeds to microbial contaminants on the hands<sup>[8]</sup>.

From preliminary survey of the setting and operation of the market, it was discovered that market is not organized into specific commodity sections for better access by customers to article for purchase. Thus, it is a common event to see a meat seller sharing the same space with a woman selling cooked rice. Similar microbiologically unhealthy settings abound in the market. This condition leads to cross-contamination by microbes via the

activities of disease vectors like houseflies. It was also discovered that sanitary conveniences like public toilets and urinary are insufficient in the market. Heaps of refuse that constitute breeding grounds of disease vectors are also constantly present around the market surroundings. Such places are suitable microbial media that allow the growth and formation fungal spores which are subsequently dispersed in and around the market contamination poultry feeds and other articles sold therein. Such situation can also lead to respiratory diseases like blastomycosis, Coccidioidomycosis (Valley Fever) and histoblastomycosis due to the inadvertent inhalation of the microbial spores<sup>[7]</sup>.

It is therefore strongly recommended that various producers of poultry feeds should provide service points where subsistence poultry farmers can purchase wholesome feeds without the risk of contamination. In conclusion, government and public health parastatals should raise public awareness on the human diseases that could be possibly contracted from poultry birds that consume contaminated feeds and the much needed microbial safety in commercial poultry farms in the state.

#### **REFERENCES**

1. Smith, W.T., 2005. Feed chickens properly Co-operative extension. Extension Service of Mississippi State University Service, pp: 58-60.
2. Microlivestock, 1991. A little known small animals with a promising economic future. National Academic Press Washington, pp: 79-160.
3. Jordan, F.T.W. and M. Pattison, 1999. Poultry Disease. WB Sounder, Publishers, London, pp: 24-50.
4. Pelezer, M.J. and E.C.S. Chan, 1977. Laboratory Exercise in Microbiology. Black Dot Inc. USA., pp: 13-15.
5. Ogbulie, J.N., J.C. Uwaezuoke and S.I. Ogiehor, 1998. Introductory Microbiology Practical. Springfield Publishers, Owerri, pp: 162.
6. Barnnet, H.L. and Hunter, 1972. Illustrated General of Imperfect. Fungi 4th (Edn.), Macmillan Publishing company New York, pp: 10-12.
7. Prescott, L.M., J.P. Harley and D.A. Klein, 2005. Microbiology. McGraw Hill, pp: 992.
8. Jawetz, E., J.L. Melnick and E.A. Adelberg, 1995. Medical microbiology. Appleton and Lange, Norwalk, pp: 656.