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Microbial Contamination of Ready-to-Eat Fried Chicken Meat Sold in two Selected Motor Park Points in Abakaliki, Ebonyi State, Nigeria

Orji Jerry, Ugbo Emmanuel, Ejikeugwu Chika*, Okonkwo Eucharia, Nwuzo Agabus, Moses Ikechukwu, Nwakaeze Emmanuel, Agumah Nnabuife and Ogene Lilian

Department of Applied Microbiology, Faculty of Sciences, Ebonyi State University, Abakaliki, Nigeria

*Corresponding Author E-mail: ejikeugwu_chika@yahoo.com

ABSTRACT

The present study was designed to investigate the microbial profile of vended ready-to-eat fried chicken meat around two selected motor parks in Abakaliki metropolis, Ebonyi State, Nigeria by using pour plate culture method. The isolated organisms were screened and characterized using standard microbiological and biochemical methods. The result of the total plate counts of bacteria and fungi from ready-to-eat fried chicken meat collected from Nkalagu junction motor park and Nwaezenyi motor park (both in Abakaliki metropolis) were $3.6x10^5$ CFU/ml, $4.3x10^4$ CFU/ml; and $0.25x10^5$, $0.25x10^4$ respectively. The bacteria and fungi species isolated from the fried chicken meat analyzed in this study include: Staphylococcus spp. 2(6.7%), Salmonella spp. 4(13.3%), Bacillus spp. 3(10.0%), Escherichia coli 6(20.0%), Pseudomonas spp. 8(26.7%), Enterobacter spp. 5(35.7%); Penicillium spp. 3(21.4%), Aspergillus spp. 5(35.7%), Neocosmospora spp. 2(14.2%) and Mucor spp 4(28.5%). This study has shown that the fried chicken meat sold in this region contains some infectious disease agents that are of bacterial- and fungal- origin; and these organisms could be responsible for some of the food-related diseases that occur in these locations. Poor hygienic conditions of food handlers, poor food processing, and poor food preservation and packaging practices are some of the contributing factors to the occurrence of foodborne diseases. The continuous inspection of food processing centers coupled with the practice of good personal hygiene by food handlers will ensure the production and release of quality food that are microbiologically safe for the public.

Key word: *Microbial food contamination, food spoilage, food poisoning, Ready-to-eat food, Abakaliki*

INTRODUCTION

Poultry meat provides nutritionally beneficial food containing protein of high quality. This is accompanied by low levels of fat which have a favourable mix of fatty acids[1]. Chicken meats contain about two to three times as much polyunsaturated fat as most types of red meat when measured by weight. However, for boneless, skinless chicken breast, the amount is much lower[2]. The muscle tissue (which represents the major edible part of the chicken) is considered most important in terms of poultry meat[3]. Poultry meat is one of the most perishable of all important foods since it contains sufficient nutrient needed to support the growth of microorganisms[4,5]. The major constituents of poultry meat are water, fat, phosphorus, protein, iron and vitamins. Most poultry meat have high water content corresponding to the water activity (a^w=0.99) which is suitable for microbial growth[6]. Poultry meat is considered to be spoiled when it is unfit for human consumption. Microorganisms such as *Staphylococcus*

aureus, *Salmonella* spp, *Mucor* spp, *Campylobacter* spp, *Pseudomonas* spp, *Micrococcus*, *Moraxella*, lactic acid bacteria and various genera of *Enterobacteriaceae* family grow on meat causing visual, textural and organoleptic changes that results in the spoilage of the meat[7,8,9]. Among the factors that affect microbial growth in meat are intrinsic properties such as physical and chemical properties of the meat and extrinsic factor such as environment factors[7,9,10]. Food borne microbiological hazards may be responsible for as many cases of illness as possible each year and are thus an important food safety challenge. To lower the incidence of food borne diseases, many experts and stakeholders urge the development of a science and risk-based food safety system, in which decision makers prioritize hazards and interventions using the best available data on the distribution and reduction of risks. The preservation of meat as a perishable food usually is accomplished by a combination of preservation methods which greatly lengthen the keeping quality of the poultry meat and its products[11]. In view of these, this study was carried out to ascertain the level of microbial contamination on ready-to-eat fried chicken sold in some locations in Abakaliki, Nigeria.

MATERIALS AND METHODS

Study Area: The study areas are two semi-settlement areas of old Abakaliki zone, which are Nkalagu junction Motor Park located at Abakaliki-Enugu road and Nwaezenyi motor park located at Abakaliki – Calabar road. Abakaliki is the capital city of the present day Ebonyi State in South-Eastern Nigeria. It lies on the longitude 8°.06' East of Greenwich meridian and latitude 6°.20' North of the Equator.

SAMPLE COLLECTION: A total of four ready-to-eat fried chicken samples were collected from Nkalagu junction motor park and Nwaezenyi Motor Park in Ebonyi State Nigeria. Two ready-to-eat fried chicken samples were collected from each of these motor parks and were aseptically packed in sterile polythene bags and transported immediately to microbiology laboratory of Ebonyi State University for proper microbiological analysis.

BACTERIAL AND FUNGI ISOLATION: The samples were examined individually for the presence of bacteria and fungi using conventional bacteriological and mycological media. A 5 g portion of each of the samples was cut-off using sterile surgical blade and forceps. These cut-off portions was introduced into sterile test tubes and allowed to soak in 50 ml sterile water for 10 minutes, before it was vigorously shaken to homogenize. The homogenate was subjected to 10 fold serial dilution. One milliliter of diluted homogenate was pour plated and/or spread plated on Nutrient Agar, MacConkey Agar, Eosin Methylene blue Agar, Salmonella-Shigella agar and Sabouraud Dextrose Agar; and these were incubated at 37°C for 18-24 hours (for bacterial isolation) and 72 hours (for fungal isolation). Suspect cultures were subcultured onto freshly prepared bacteriological and mycological media as aforementioned, and incubated at the recommended temperatures. The characteristic colonies were aseptically isolated and bacterial strains were sub-cultured on nutrient agar slants and stored at 4°C for further use[12].

CHARACTERIZATION AND IDENTIFICATION OF FUNGAL AND BACTERIAL STRAINS: The isolated bacterial and fungal isolates were characterized morphologically and identified using standard microbiological standard and biochemical test including Gram staining, catalase test, indole test, oxidase test, citrate test, methyl red test, coagulase test, sugar fermentation test, vogues proskauer test, spore staining (Malachite Green Method) and Lactose Phenol cotton Blue staining. Motility was confirmed by hanging drop method[12,13,14].

RESULTS

The average bacteria and fungi count obtained from Nkalagu junction motor park (inside) [NK1], Nkalagu junction motor park (outside) [NK2]; Naezenyi motor park point (inside) [NW1] and Nwaezenyi motor park point (outside) [NW2] are $3.6x10^5$ and $4.3x10^4$; $0.25x10^5$ and $0.25x10^4$ respectively (Table 1). The results indicate that six (6) bacteria and four (4) fungi isolates which includes *Staphylococcus* spp. *Salmonella* spp. *Escherichia* spp. *Pseudomonas* spp. *Enterobacter* spp. *Bacillus* spp. and *Penicillium* spp., *Neocosmospora* spp. *Mucor* respectively were implicated in the microbial spoilage of ready-to-eat fried chickens.

Table 1: Total plate counts of bacteria and fungi isolates from ready-to-eat fried chicken

Location	Average colonies		Dilution factors (Cfu/ml)	Bacteria count	Fungi count
	Bacteria	Fungi			
NK1	40	02	10^5	$4.0x10^5$	$0.2x10^5$
NK2	48	03	10^4	$4.8x10^4$	$0.3x10^4$
NW1	32	03	10^5	$3.2x10^5$	$0.3x10^5$
NW2	38	02	10^4	$3.8x10^4$	$0.2x10^4$

Key:

NK1 = Nkalagu junction motor park (inside)
NK2 = Nkalagu junction motor park (outside)
NW1 = Nwaezenyi motor park point (inside)
NW2 = Nwaezenyi motor park point (outside)

Table 2 shows the percentage frequencies of the individual bacterial and fungal organisms recovered from the ready-to-eat fried chicken analyzed in this study. The bacterial and fungal organisms isolated were *Staphylococcus* spp. 2 (6.7%), *Salmonella* spp. 4 (13.3%), *Bacillus* spp. 3 (10.0%), *Escherichia* spp. 6 (20.0%), *Pseudomonas* spp. 8 (26.7%), *Enterobacter* spp. 7 (23.3%); *Penicillium* spp. 3 (21.4%), *Aspergillus* spp. 5 (35.7%), *Neocosmospora* spp. 2 (14.3%) and *Mucor* spp 4 (28.6%).

Table 2: Percentage frequency of bacteria and fungi isolates from ready-to-eat fried chicken

Microorganisms		Occurrence frequency		% frequency	
Bacteria	**Fungi**	**Bacteria**	**Fungi**	**Bacteria**	**Fungi**
Staphylococcus spp.		2		6.7	
	Penicillium spp.		3		21.4
Salmonella spp.		4		13.3	
	Aspergillus spp.		5		35.7
Bacillus spp.		3		10.0	
	Neocosmospora spp.		2		14.3
Escherichia spp.		6		20.0	
	Mucor spp		4		28.6
Pseudomonas spp.		8		26.7	
Enterobacter spp.		7		23.3	

DISCUSSION

The present study evaluated the microbial spoilage of ready-to-eat chicken meat sold in Nkalagu junction motor park and Nwaezenyi motor park point, both in Abakaliki Metropolis, Ebonyi State, Nigeria. *Staphylococcus* spp., *Salmonella spp.*, *Bacillus* spp., *Escherichia* spp., *Pseudomonas* spp., and *Enterobacter* spp. were the bacterial isolates recovered or isolated from the ready-to-eat fried chicken while *Penicillium* spp., *Aspergillus* spp., *Mucor* spp., and *Neocosmospora* spp., were the fungal organisms isolated from the ready-to-eat fried chicken. These organisms have been previously reported to be responsible in causing microbial contamination of food spoilage especially meat and other meat-related products.[6,9,10,15] The results obtained in this study as per the microbial organisms recovered from the ready-to-eat fried chicken are akin to a recent study conducted in southeastern Nigeria in which Iroha *et al*[13] reported the microbial contamination of raw meat sold in some parts of Abakaliki metropolis, Ebonyi State, Nigeria. The findings in this study are also in agreement with previous studies conducted outside Nigeria – in which these organisms where implicated as major causes of microbial food spoilage and contamination of ready-to-eat fried chickens.[16,17] Our findings also agreed with the works of Koutsoumanis *et al.*,[15] and Doulgeraki and Nyches[10] also agreed with our findings on the possible microorganisms that causes spoilage and contamination of chicken products. The category of microbes isolated from the ready-to-eat fried chicken in this study has been implicated in causing food poisoning

and other foodborne illnesses; and they are of public health importance.[17,18] The results of average total plate counts of bacteria and fungi from these study shows that Nkalagu junction motor park 1, 2 and Nwaezenyi motor park 1 and 2 were 3.6 x 10^5 and 4.3 x 10^4; 0.25 x 10^5 and 0.25 x10^4 CFU/ml respectively. *Pseudomonas* spp. 8(26.7%) had the highest rate of occurrence while *Bacillus spp.* 3(10.0%) was the least isolated organism for bacteria. *Aspergillus* spp. 5(35.7%), had the highest occurrence rate, while *Neocosmospora* spp. 2(14.3%) had the least percentage occurrence for fungal organisms isolated. Some of these organisms isolated are found to be soil inhabiting organisms which could have resulted from soil contamination of processed chicken; and this could be as a result of poor storage, packaging and poor perseveration of already processed chicken meat. Poor hygienic practices in the storage, processing and preservation of food products especially meat could cause the outbreak of foodborne diseases. In conclusion, this study presented the level of microbial spoilage and contamination status of ready-to-eat fried chicken meat sold in two locations in Ebonyi State, and the role of such contaminated meat in causing food poisoning amongst other foodborne related illnesses. It is therefore critical for government and other food- regulatory agencies to step up their surveillance of some food-processing centers in this region with a view to ensuring that there operations are within the specified limits. Food especially fried chicken products meant for human consumption should be microbiologically safe otherwise it can serve as route for the transmission of foodborne diseases.

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