BACTERIOLOGICAL SCREENING OF ROASTED CHICKEN SOLD IN JOS AND ENVIRONS

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Abstract
This work was carried out to screen for the presence of bacteria in roasted chicken sold in Jos and environs. A total of 20 roasted chicken parts randomly collected from different selling points in Jos and environs were bacteriologically examined using standard microbiological method according to Cheesbrough, (2000). Based on the colonial morphological and biochemical test, the following bacteria species were isolated: *Salmonella spp* (37%) *Escherichia coli*. (30%), *Clostridium spp* (9%), *Streptococcus spp* (7%), *Klebsiella spp* (7%), *Corynebacteria spp* (7%). *Staphyloccocus spp* (5%), *Bacillus spp* (5%) and *Serratia spp* (5%). This may indicate poor hygienic practice and suggest the risk of infection and health hazard to consumers. We therefore recommend good handling/hygiene in processing. More so, preheating of roasted chicken before consumption is recommended.
Keywords: Bacteria, Screening, Roasted Chicken, Jos

Introduction

Bacteria are microscopic organisms that are ubiquitous (Alonge, 2001). They vary in types and shapes, and those that cause disease are harmful and are referred to as pathogens. The common ways in which bacteria and other micro-organisms spread are by the air, contact, insect and other creatures. According to Alonge, (2001), cross contamination is a cause of food poisoning that is often overlooked. This occurs when harmful bacteria are spread between food surfaces and equipment.

Meat contamination could constitute human health hazard due to production of toxin by some bacteria. Data on food borne diseases are well documented worldwide. In United States, it has been estimated that seven pathogens found in animal products such as *Eschericiah coli* 057:7, *Listeria monocytogenes, Campylobacter jejuni, Clostridium perfringes, Salmonella spp., Toxoplasma gondii* and *Staphylococcus aureus* account for approximately 303.12.3 million cases of food borne illness and a record of 39,000 each year (Hazariwala *et al.,* 2002).

Meat is often handled under un-hygienic conditions by the meat vendors which could lead to heavy contamination with pathogenic bacteria if sold to the public as ready to eat food. Tsang (2002), described ready to eat food as the status of foods being ready for immediate consumption at point of sale. Outbreaks of food borne diseases are caused by foods that are contaminated during harvesting, processing or preparing. According to Macfariance (1993), food borne disease is defined as disease resulting from ingestion of bacteria, toxins and cells produce by micro-organisms present in food.

The presence of bacteria in roasted meat at times may be as a result of slaughtering of animals that are previously infected with a particular disease without proper treatment or as a result of surface contamination by the meat vendors, wind or by ingredient used in meat treatment such a barbecue, knife, sharp pointed sticks, charcoal, roasted trays, spoon, water etc. Roasted meat being displayed uncovered by the meat vendors exposed the meat to bacteria contamination (Macfariance, 1993). According to FAO/WHO (2003), more than 250 diseases can cause food poisoning. Some of the most common diseases are those caused by bacteria such as *campylobacter*, *salmonella*, *shigella, E coil* 0157 H7*, listeria* and botulism. People infected with food borne organisms may be asymptomatic or may have symptoms ranging from mild intestinal discomfort to severe dehydration and bloody diarrhea depending on the type of infection. People can even die as a result of food poisoning. This study was carried out to screen for the presence of bacteria in roasted chicken sold in Jos and environs and to determine the occurrence in relation to location.

Materials and Methods

The materials used for this study are autoclave, roasted chicken part, incubator, Durham tube, hot air oven, petri dishes, wire loop, bunsen burner, microscope, disposable hand gloves, polythene bag, cotton wool, needle and syringe, spatula, metler balance, universal bottles, glass slide, slide cover, refrigerator, EDTA bottle, measuring cylinder, masking tape, distil water. The culture media used are blood agar, MacConkey agar (mck), *Salmonella-Shigella* agar (SSA), Peptone water, Eosinomethylene agar (EMB) and nutrient agar.

Sample Collection and Processing

Samples were collected from the following locations within Jos and environs of Plateau State Nigeria: British America Junction, Polo, West of Mine, Apata, Terminus, Abattoir, Tina Junction, Laranto, Hill station junction, Dogon Dutse, Trade Centre, Angle D, Vom Market, Zawan, Mararaba Jama'a, Gyel Market, Bukuru Low cost, K-Vom and Kugiya Junction.

The samples (roasted chicken parts) were collected from different selling points using sterilized polythene bags and disposable hand gloves. A total number of 20

samples were collected and transported on ice pack to microbiology laboratory of Federal College of Animal Health and Production Technology Vom for analysis.

The samples collected were taken to the laboratory and each of the samples was macerated and 1g of each was picked and placed into peptone water broth and incubated overnight at 37^{O}C. The agars prepared were autoclaved and allowed to take room temperature after which they were poured into plates and allowed to solidify. The plates were incubated upside down to ensure complete dryness of the agar. The plates were removed from the incubator, an inoculum was fetched from a sample using wire loop and streak into a plate containing for the other plates. The plates were then incubated overnight at 37^{O}C.

All wares used were thoroughly washed with detergent rinsed with clean water and dried. Glass wares were wrapped in foil paper and sterilized in the oven at 180^{O} for 30 minutes. All media and diluents used were sterilized by autoclaving at 121^{O}C for 15 minutes.

All inoculation petri-dishes were incubated in an incubator upside down in order to prevent surface contamination. The incubation was done at the temperature of 37^{0}C for 24hours. Plates showing growths were subjected to macroscopic, and biochemical examinations depending on their growth patterns and reactions. Plates showing no growth were re-incubated and at the end of another 24 hours designated 'no growth' if no growth was seen.

Bacterial Isolation and Biochemical Identification

Isolation

A smear of each bacterial isolate was prepared using a drop of sterile water on a clean grease-free slide. The smear was air dried and then heat-fixed by passing it over flame 2-3 times. It was then flooded with Crystal violet for about 30-60 seconds, drained and rinsed with water. It was yet flooded with Lugol's iodine which was left for seconds, and the slide was rinsed gently with water, and drained off. The slide was then flooded with acetone alcohol until the slide appeared free of violet stain. It was then rinsed with water and flooded with neutral red for 30seconds after which it was drained, with water and blotted dry. Microscopic observation was done under the oil immersion objectives lens. Gram positive bacteria stained purpled while gram negative stained red (Tortora *et al.,* 2010).

Biochemical Identification

Motility Test

Hanging drop method was used in which one loop fill of a smooth suspension of isolates was applied and placed on a clean slip then the edges of the cover slip was applied with the Vaseline. A cavity slide was then inverted over the cover slip; the preparation was then examined under x40 objective lens for evidence of motility (Cheesbrough, 2003).

Catalase Test

A smooth suspension of each isolate was prepared on a glass slide and three drops of 30% Hydrogen peroxide (H_2O_2) were added. A positive result was shown by immediate effectiveness of the mixture (Cheesbrough, 2003).

Indole Test

Peptone water was incubated with the isolated organisms and incubated at 37ºC for 24hours and 0.5ml of Kovac's reagent was added. The mixture was examined after one minute for the development of a Resepink colour at the peptone water culture Kovac's reagent interphase (Cheesbrough, 2003).

Citrate Test

Slants of Simean's citrate agar was inoculated with isolate from pure stock culture and incubated at 37ºC for 24hrs. Blue colour and streak of growth indicted a positive result while negative result was shown by the retention of the original green colour and absence of growth observed (Cheesbrough, 2003).

Methyl Red Test

Peptone sugar broth in test tubes was incubated with isolates at 37ºC for 24hrs. After this, 5 drops of methyl red reagent were added to 5ml of culture and the reaction was indicated by the brigade red colour of the broth while a yellow colour indicated a negative result (Cheesbrough, 2003).

RESULTS

Table 1: Bacteria Identification

										SUGAR FERMENTATION			
Shape	**Morphology**	**Gram reaction**	**spore**	**Mortiligy**	**Catalase**	**Indole**	**Methy red**	**Voges Proskevr**	**Citrate**	**Lactose**	**Sucrose**	**Glucose**	**Mantol**
Round	Short rods	-	-	+	+	+	+	-	-	AG	AG	AG	AG
Round	Moderate rod	-	-	+	+	-	+	-	+	-	-	A	AG
Round	Long rod	-	-	-	+	-	-	+	+	AG	AG	AG	AG
Round	Short rod	-	-	+	+	+	+	-	+	AG	A	AG	AG
Round	Moderate rod	+	+	-	+	-	-	-	+	-	-	A	A
Round	Cluster cocci	+	-	-	+	-	+	-	-	A	A	A	A
Round	Chain cocci	+	+	-	-	-	-	+	+	A	A	A	-
Round	Rod	+	-	-	+	-	+	-	+	G	G	A	A
Round	Rod				+	+	+	-	+	A	A	A	-

KEY

- \- = Negative
- \+ = Positive
- A = Acid
- AG = Acid + Gas production
- G = Gas

Nine (9) bacteria were identified in this study. This includes:
Escherichia coli, Salmonella spp., Klebsiella spp., Serratia spp., Bacillus spp., Staphloccocus spp., Streptococcus spp., Clostridium botilinum and *Corynebacteria diphterace.*

Table II: Overall Bacteria Prevalence

Location	*E.coli*	*Salmonella*	*Klebsiella*	*Bacillus*	*Serratia*	*Staphylococus*	*Streptococcus*	*Clostridium*	*Corynebacteria*		
P	-	1	-	-	-	-	-	1	1	3	6.98%
AP	1	1	-	-	-	-	-	-	-	2	4.65%
DD	1	1	-	-	-	-		1	-	3	6.98%
WM		-	1	-	-	-	-	1	-	2	4.65%
BAI	-	1	-	-	-	-	1	-	-	2	4.65%
AB	-	1	-	-	-	-	1	-	-	2	4.65%
T	1	-	1	-	1	-	-	-	-	3	6.98%
HSJ	-	1	-	1	-	-	-	-	-	2	4.65%
L	-	1	-	-	-	-	-	-	-	2	4.65%
TJ	1	1	-	-	-	-	-	-	-	2	4.65%
VM	-	1	-	-	-	1		-	-	2	4.65%
OAJ	-	1	-	-	-	1	-	-	-	2	4.65%
BL	1	1	-	-	-	-	-	-	-	2	4.65%
Z	1	-	-	1	-	-	-	-	-	2	4.65%
AD	-	1	1	-	-	-	-	-	-	2	4.65%
GM	1	1	-	-	-	-	-	-	-	2	4.65%
KV	1	1	-	-	-	-	-	1	-	3	6.98%
TC	1	-	-	-	1	-	-	-	-	2	4.65%
K	-	-	1	-	-	-	-	-	-	1	2.33%
MJ	-	1								2	4.65%
TOTAL									**43**	**100**	

KEY: Positive = +
Negative= -

P = Polo, AP = APata, DD = Dogon Dutse, WM = West of Mine, BAJ = British America Junction, AB = Abattoir, T = Terminus, HSJ = Hill Station Junction, L = Laranto, TJ = Tina Junction, VM = Vom Market, OAJ = Old Airport Junction, BL = Bukuru Lowcost, Z = Zawan, AD = Angle D, GM = Gyel Market, KV = K-Vom, TC = Trade Centre, K = Kugiya, MJ = Mararaba Jama'a.

The table above shows percentage occurrence of bacteria isolates in respect to location on roasted samples worked on, Dogon Dutse, Polo, Terminus and K/Vom has the highest prevalence 4.65% while Kungiya has the lowest prevalence 2.43% of the bacteria isolates.

Table III: Showing prevalence of bacteria organisms isolated

Species	Occurrence	% Prevalence
Escherichia coli	9	30%
Salmonella spp.	16	37%
Clostridium spp.	4	9%
Klebsiella spp.	3	7%
Corynebacteria spp.	3	7%
Streptococcus spp.	3	7%
Staphylococcus spp.	1	2%
Bacillus spp.	2	5%
Serratia spp.	2	5%
Total	**43**	**199%**

The table above shows the occurrence and percentage prevalence of each bacteria isolates in the sample

worked on *Salmonella* has the highest percentage of 37% followed by *Escherichia coli* with 30% while *Staphylococcus* had the lowest percentage of 5%.

Table IV: Bacteria Prevalence

Isolates	Isolates Jos South	% Prevalence
Salmonella	7	35
Ecoli.	5	25
Staphylococcus	1	5
Streptococcus	1	5
Serratia	1	5
Bacillus	1	5
Corynebacteria	1	5
Clostridium	1	5
Klebsiella	2	10
Total	**20%**	**100%**

The table above shows organisms isolated and their % occurrence in Jos South *Salmonella* has the highest occurrence 35% while *Staphylococcus, Streptococcus, Serratia, Bacillus Corynebacteria* and *Clostridium* have the lowest occurrence 5%/

Table V: Bacteria Prevalence in Jos North

Isolates	Jos North	% Prevalence
Salmonella	9	39%
E.coli	4	18%
Clostridium	3	13%
Klebsiella	1	4%
Serratia	1	4%
Corynebacteria	1	4%
Streps	2	9%
Bacillus	2	9%
TOTAL	**23**	**100%**

The above table shows bacterial organisms isolated and occurrence in Jos-North with *Salmonella* having the highest percentage occurrence (39%) while *Klebsiella, Serratia* and *Corynebacteria* having the least percentage occurrence (4%).

Discussion and Conclusion

The following bacteria were isolated from the sample: *Salmonella spp. Escherichia coli, Klebsiella spp., Corynebacteria spp., Streptococcus spp., Staphylococcus spp., Clostridium spp., Bacillus spp.* and *Serratia spp*. Bacteria species like *Escherichia coli, Salmonella spp*, and *Klebsiella spp,* are of public health importance as they have been incriminated in various diseases of man such as gastroenteritis FAO/WHO, (2003). There was high prevalence of these bacteria in roasted chicken sold in Jos and environs as show in this study. This finding agrees with the earlier publications of FAO/WHO, (2003) which stated that in developing countries, salmonellosis, shigellosis, klebsiellosis, colibacillosis are prevalent due to people's feeding habit as well as unhygienic way of preparing and roasting of the meat. In contrast, Carol (2007) reported a 0.0% prevalence of microbial contamination of roasted chicken sold in Jos. The presence of contamination in our study may be due to unhygienic and improper handling of the chicken during processing or selling. Jos North has the highest number of isolates (23) while Jos South has the least (20) compare to Jos North as shown in table IV and V above. Roasted chicken from different locations varied in the number and specie isolated and this could be as a result of spices and packaging method adopted. The prevalence of microbial contamination of the roasted chicken was higher (23.0%) in those sampled in Jos North than in those sampled in Jos South (20.0%). This may not be unconnected to lack of training in food preparation which is necessary and important for hygienic handling of food as reported by FAO (1990). The presence of the bacteria could be due to oil, spices and contaminated utensils used. The above bacteria organisms isolated in this study could be pathogenic or opportunistic pathogens and pose a health risk especially in infants or immune-compromised individual.

Conclusion

In conclusion, the presence of bacteria shown in the result may be that the organism were present in the raw chicken that were roasted or due to cross-infection during preparation, insufficient application of heat to the deep tissues and perhaps because of contamination from potential buyers, meat handlers, hands, trays and the open air environment. The study therefore recommend good hygienic practices among roasted chicken handlers/sellers and preheating of the roasted chicken before consumption. We also recommend further studies to include determination of antibiotic susceptibility pattern of the pathogenic isolates and the possible sources of contamination by sampling utensils, papers, tables/containers used by the sellers.

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