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Antibiogram of Bacteria Isolated from Roasted Bush Meat and Chicken Samples Sold in Afikpo, Nigeria

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Abstract-*This study was to determine the antibiogram of bacteria isolated from roasted chicken and bush meat sold in Afikpo North L.G.A. The sampling sites emplored in this study were Afikpo (site 1), Amasiri(site 2), Oziza(site 3), Uwana(site 4), Enohia (site 5). The bacteria isolated from bush meat were Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, Klebsiella pnuemoniae, Shigella and Salmonella species while the chicken samples bacteria isolated were Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus fecalis, Proteus vulgaris, P.mirabilis Escherichia coli, Klebsiella pnuemoniae, Shigella and Salmonella species. The chicken samples had more bacteria contamination than the bush meat and this could be due to the moisture content, temperature and pH. Moisture content had a range of 86-95(%) while the bush meat had a moisture content of 83-88(%). The pH on the chicken sample ranged from 6.5-7.7 while the bush meat had a pH value range of 6.8-7.4. The temperature had a range of 30-38(^oC), while the bush meat had a temperature range of 33-54(^oC). The different microbial groups were enumerated and for the roasted chicken samples, Total aerobic count had a range of 6.6 x 10^6- 12.4 x 10^6 cfu/ml, Total coliform count 5.0x10^5 – 9.2x10^5 cfu/ml, total fecal coliform count had a range of 3.0x10^5 - 4.9x10^5 cfu/ml, total Salmonella and Shigella count, 1.6x10^4 - 4.0x10^4 cfu/ml and total Staphylococal count had a range of 0.8x10^4-3.6x10^4 cfu/ml while for the bush meat samples, Total aerobic count was 7.9x10^5-12.4x10^6 Cfu/ml, total coliform count 5.8x10^5 – 8.9x10^5 Cfu/ml, total fecal coliform count 1.9x10^5 – 5.5x10^5 cfu/ml, total Salmonella and Shigella count, 0.8x10^4 - 4.5x10^4 cfu/ml and total Staphylococal count had a range of 0.5x10^4-4.1x10^4 cfu/ml .there was no significant difference ($p<0.05$) between the chicken and bush meat samples in the same location but there was a significant difference($p<0.05$) between the microbial loads on the chicken and bush meat samples at the 5 different sites. Antimicrobial susceptibility test showed that the gram negative bacteria were more resistant than the gram positive bacteria and the isolates from the chicken were more resistant than the bacteria from the bush meat. Ciprofloxacin and perfloxacin showed the most sensitivity to the bacteria isolated from both samples while most drug they were resistant to were septrin (SXT), Ampicillin (AM) and Septromycin(S). This study therefore show that improper hygienic practices and exposure of roasted chicken and meat popularly sold in Afikpo could pose as a public health threat to the consumers.*

Keywords- *bacteria, bush meat, chicken, Escherichia coli, Klebsiella pnuemoniae, roasted, Salmonella, Shigella, sites, Staphylococal*

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I. INTRODUCTION

Meat is excellent in supplying high quality protein, vitamins and minerals salt. Similarly, it has been reported as ideal for the growth of a wide range of spoilage bacteria [1] accounting to a great extent why it is perishable.

The high moisture content, low temperature and high pH of meat generally makes it very susceptible to microbial growth even under the best handling or manufacturing conditions and practices [2]. Sequel to the developments, some researches had noticed sporadic cases of gastroenteritis and symptoms of infection after consumption of improper cooked meat which indicated that the product indeed constitute a food safety risk [3]
Meat is considered as the most important source of proteins consumed by humans. However, meat is the most perishable of all staple foods since it contains sufficient nutrient needed to support the growth of microorganisms [4].

It is a common practice in Ebonyi State and many other parts of Nigeria to roast bush meats (meat of wild animals such as; antelope, grass cutter, deer and many others) and sell to motorists along highways. The hygiene practice in this business is usually poor due to the low level of hygiene education. To lower the incidence of food-borne diseases adequate interventions using the best available data on the distribution and reduction of risks is indispensable [5].

chicken

Chicken are good sources of animal protein of high biological value, which contains all the essential amino acids, required for human nutrition, besides that they contain higher proportion of unsaturated fatty acids and less cholesterol especially when skin is removed[6]. The acceptance of further processed chicken meat products depends upon overall acceptance, color, odor, taste and consistency. So, consumers had given much greater choice over the foods which are more selective, of high quality and cheap about the value of money.

Bush meat

The term ‘bush meat’ is frequently used to describe the meat from any terrestrial wild animal that is killed for subsistence or commercial purposes [7] with species typically including large mammals, primates, antelope, frogs, snakes, rodents, bats, and even insects and termites. These species are often sold on the road side or at local markets to supply a much needed source of cash revenue [8].There is growing evidence that points to the importance of wildlife as a source of nutrition, medicine and spiritual values in many human cultures in tropical and subtropical areas worldwide. The meat of wild animals in particular, commonly referred to as bush meat, has formed a part of the staple diet of forest dwelling peoples for millennia and remains a primary source of animal protein, micro-nutrients and fat [9].Bush meat is also a significant source of revenue for many forest families . Consumers often consider bush meat a wholesome, safe alternative to commercially produced meat on sale at grocery stores. In some regions, it is preferred to farm-raised meats for its taste or based on the perception that industrial meats contain chemicals and additives. Moreover, bush meat also plays a special role in the cultural and spiritual identity of indigenous peoples [9].

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Antibiogram

An antibiogram is an overall profile of antimicrobial susceptibility testing results of a specific microorganism to a battery of antimicrobial drugs. Data are summarized periodically and presented showing percentages of organisms tested that are susceptible to a particular antimicrobial drug.

Antibiotic/Antimicrobial resistance is the ability of microbes to resist the effects of drugs that is, the germs are not killed, and their growth is not stopped. Although some people are at greater risk than others, no one can completely avoid the risk of antibiotic-resistant infections. Infections with resistant organisms are difficult to treat, requiring costly and sometimes toxic alternatives.

Bacteria

Bacteria are a major source of microbial contamination of food, i.e. the undesired presence in food of harmful microorganisms or the harmful substances they produce. Viruses, parasites and fungi are also able to contaminate food and cause food-borne illnesses in humans.Bacteria are a major source of microbial contamination of food, i.e. the undesired presence in food of harmful microorganisms or the harmful substances they produce. Viruses, parasites and fungi are also able to contaminate food and cause food-borne illnesses in humans.The possible sources of these bacteria are likely to come from the skin of the animal from which the meat was obtained. Other potential sources of **microbial contamination**s are the equipments used for each operation that is performed until the final product is eaten; the clothing and hands of personnel and the physical facilities are all implicated[10].Bacteria will inevitably find ways of resisting the antibiotics develop by humans, which is why aggressive action is needed now to keep new resistance from developing and to prevent the resistance that already exists from spreading.

The aim and objective of this study were

*Isolation and characterization of the Bacteria isolates from the bush meats and roasted chicken sold at the 5 different areas in Afikpo.

* Determination of the moisture content and pH of the bush meats and chicken from the 5 different areas in Afikpo

* Determination of the antibiotic sensitivity pattern of the isolates from the 5 different areas in Afikpo.

II. MATERIALS AND METHODS

Collection of samples

Samples were bought commercially from the roasted bush meat and chicken sellers randomly from the five different areas. This was wrapped with new sterile ziplock bags and sealed. This was immediately transferred to the microbiology laboratory of Abia State University, Uturu within 1-2 hours of purchase, for examination and further analyses.

Determination of pH

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This was determined using a pH meter that was calibrated previously. 10g of the sample was taken, blended and mixed with 90ml of sterile distilled water. It was thoroughly mixed and then measured with the pH meter,(HANNA-pH210) [11].

Determination of moisture content

The moisture content of the samples was determined using the method of [11]. An empty crucible with the lid was dried in an oven at 100^0c for 3 hours and was transferred to a desiccator to cool. This was weighed accurately and recorded. 50grams of the sample was then transferred into the crucible and was spread uniformly, then weighed and recorded. The crucible and the sample were dried in the oven at 105^oc for another 3 hours. After drying, the crucible with partially covered lid was transferred into a desiccator to cool. The crucible and the dried samples were then weighed.

It was then calculated using the formular

$$\%\text{Moisture(wt/wt)} = \frac{\text{wt of wet sample} - \text{wt of dry sample}}{\text{wt of wet sample}} \times 100$$

Preparation of samples

Bush meat and chicken samples were prepared by homogenizing a portion using a sterile mortar and pestle, a portion of the meats were macerated then 1 gram of the different samples where weighed. A tenfold serial dilution was done as follows; 1 gram of the sample was added into 9mls of normal saline, using a pasteur pipette, 1ml was then added to the next tube from the first one(10^{-1}). This was repeated till the tenth tube (10^{-10}), and then 1ml was discarded. The4th, 5th and 6thtube was used for the analysis.

Inoculation

Inoculation was done onto solidified surfaces of *Salmonella shigella* agar, Manitol salt agar, Macconkey agar, Nutrient agar, Eosin methylene blue (EMB) agar. Inoculation was done by spread plate method as described by [12]. This was done by spreading 0.1ml of the sample on to the surface of the freshly prepared media using an ethanol flamed L shaped glass rod. This was allowed to stand for 15 mins, and then they were incubated at 37^0C for 24hours except EMB which was incubated at 44^oC.

Determination of microbial load:

This was done by counting the individual colonies that were observed on the incubated plates and recorded. The numbers obtained were then calculated using the formula:

$$\text{Cfu} = \frac{\text{number of colonies}}{\text{Dilution factor x volume used}}$$

IDENTIFICATION OF THE BACTERIA ISOLATES*:*

Bacteria were identified using their morphological characteristics, gram staining, and biochemical test. Characterization was done by observing their morphology on agar plates which included their shape, color, size, texture and elevation.

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III. RESULTS

The antibiogram studies of bacteria isolated from roasted chicken and roasted bush meat sold in some areas of Ebonyi state was carried out in this research.

Table 3.1 shows the Total aerobic Count (TAC), Total coliform count (TCC), Total *Salmonella* and *Shigella* counts (TSSC), total fecal coliform count(TFCC) total staphylococcal count (TSC), from the 5 different sites.

Table 3.1:TOTAL MICROBIAL COUNTS FROM THE BUSH MEAT AND CHICKEN FROM THE 5 SITES

	TAC		TCC		TFCC		TSSC		TSC	
	CHICKEN	BUSH MEAT	CHICKEN	B. MEAT	CHICKEN	B.MEAT	CHICKEN	B.MEAT	CHICKEN	BUSH MEAT
1A	11.6 X10^6	12.4X1 0^6	8.6 X10^5	7.9 X10^5	4.6X10 ^{5}	5.1X1 0^5	4.0 X10^4	4.5 X10^4	3.2 X10^4	4.1 X10^4
1B	11.2 X10^6	10.8 X10^6	9.2 X10^5	8.6 X10^5	4.5 X10^5	4.9X1 0^5	3.6X1 0^4	3.9 X10^4	2.9 X10^4	3.1 X10^4
1C	11.9 X10^6	11.1 X10^6	7.3 X10^5	7.2 X10^5	3.5 X10^5	4.7X1 0^5	3.0 X10^4	3.7 X10^4	2.1 X10^4	3.1 X10^4
2D	12.4 X10^6	10.6 X10^6	8.1 X10^5	8.8 X10^5	4.9X10 ^{5}	5.3X1 0^5	3.8 X10^4	4.5 X10^4	3.1 X10^4	3.6 X10^4
2E	11.8 X10^6	10.3 X10^6	8.4 X10^5	8.9 X10^5	4.4X10 ^{5}	5.5X1 0^5	4.1 X10^4	4.2 X10^4	3.6 X10^4	3.4 X10^4
2F	12.1 X10^6	11.2 X10^6	8.9 X10^5	8.0 X10^5	4.1X10 ^{5}	4.8X1 0^5	3.5 X10^4	4.1 X10^4	3.1 X10^4	3.1 X10^4
3G	9.5 X10^6	9.8 X10^6	7.6 X10^5	7.9 X10^5	3.5X10 ^{5}	2.3X1 0^5	2.9 X10^4	1.6 X10^4	1.7 X10^4	1.1 X10^4
3H	10.6 X10^6	7.7 X10^6	5.4 X10^5	7.4 X10^5	3.0X10 ^{5}	2.7X1 0^5	2.1 X10^4	1.3 X10^4	1.4 X10^4	0.9 X10^4
3I	9.1 X10^6	7.0 X10^6	6.8 X10^5	6.9 X10^5	3.0X10 ^{5}	2.6X1 0^5	2.6 X10^4	1.5 X10^4	1.4 X10^4	1.1 X10^4
4J	7.7 X10^6	11.1 X10^6	5.6 X10^5	6.6 X10^5	3.1X10 ^{5}	2.3X1 0^5	2.2 X10^4	1.8 X10^4	1.2 X10^4	1.0 X10^4
4K	8.2 X10^6	7.7 X10^5	6.6 X10^5	6.9 X10^5	3.6X10 ^{5}	2.2X1 0^5	1.9 X10^4	1.6 X10^4	1.4 X10^4	1.0 X10^4
4L	8.9 X10^6	8.6 X10^5	7.4 X10^5	6.3 X10^5	3.5X10 ^{5}	3.5X1 0^5	2.1 X10^4	1.5 X10^4	1.6 X10^4	0.8 X10^4
5M	6.6 X10^6	9.6 X10^5	5.4 X10^5	6.5 X10^5	3.1X10 ^{5}	1.2X1 0^5	2.6 X10^4	0.8 X10^4	1.5 X10^4	0.3 X10^4
5N	7.2 X10^6	9.1 X10^5	5.0 X10^5	6.1 X10^5	3.0X10 ^{5}	1.8X1 0^5	2.0 X10^4	1.1 X10^4	1.2 X10^4	0.9 X10^4
5O	7.8	7.9	5.2	5.8	3.2X10	1.9X1	1.6	1.0	0.8	0.5

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O	$X10^6$	$X10^5$	$X10^5$	$X10^5$	^{5}	0^5	$X10^4$	$X10^4$	$X10^4$	$X10^4$

Key:

A-C Samples from the site 1; D-F Samples from the site 2; G-I Samples from the site 3; J-L Samples from the site 4; M-N Samples from the site 5. TAC-total aerobic count. TCC-total coliform count. TFCC-total fecal coliform count, TSSC-Total *Salmonella shigella* count, TSC -Total Staphylococcal count.

The table below shows the Comparative analyses of the individual bacteria groups enumerated from the bush meat and chicken samples at the five sites. The analyses showed that there was no significant difference ($P<0.05$) on the microbial loads on the chicken and bush meat samples from the same site, but there was significant difference ($P<0.05$) on the microbial load on the samples from the 5 different sites used for the study.

Table 3.2: Comparative analyses of the individual bacteria groups enumerated from the bush meat and chicken samples at the five sites

	Total aerobic count (TAC)		Total coliform count (TCC)		Total fecalcoliform count (TFCC)		TOTAL *Salmonella - Shigella* COUNT		TOTAL *S. aureus* COUNT (TSC)	
	CHICKEN	BUSHMEAT	CHICKEN	B. MEAT	CHICKEN	BUSHMEAT	CHICKEN	BUSHMEAT	CHICKEN	BUSHMEAT
SITE 1	11.6	12.4	8.6	7.9	4.6	5.1	4	4.5	3.2	4.1
	11.2	10.8	9.2	8.6	4.5	4.9	3.6	3.9	2.9	3.1s
	11.9	11.1	7.3	7.2	3.5	4.7	3	3.7	2.1	3.1
Mean	11.5667^A	11.43333^A	8.3666 67^A	7.9^A	4.2^A	4.9^A	3.5333 33^A	4.033333^A	2.7333 33^A	3.433333^A
std ev	0.2867 44	0.694422	0.7930 25	0.5715 48	0.4966 55	0.163299	0.4109 61	0.339935	0.4642 8	0.471405
SITE 2	12.4	10.6	8.1	8.8	4.9	5.3	3.8	4.5	3.1	3.6
	11.8	10.3	8.4	8.9	4.4	5.5	4.1	4.2	3.6	3.4
	12.1	11.2	8.9	8	4.1	4.8	3.5	4.1	3.1	3.1
mean	12.1^B	10.7^B	8.4666 67^B	8.5666 67^B	4.4666 67^A	5.2^A	3.8^A	4.266667^A	3.2666 67^A	3.366667^A
std ev	0.2449 49	0.374166	0.3299 83	0.4027 68	0.3299 83	0.294392	0.2449 49	0.169967	0.2357 02	0.20548
SITE 3	9.5	9.8	7.6	7.9	3.5	2.3	2.9	1.6	1.7	1.1
	10.6	7.7	5.4	7.4	3	2.7	2.1	1.3	1.4	0.9
	9.1	7	6.8	6.9	3	2.6	2.6	1.5	1.4	1.1
mean	9.7333	8.166667	6.6^C	7.4^C	3.1666	2.533333	2.5333	1.466667	1.5^A	1.033333

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an	33[C]	[C]			67[A]	[A]	33[A]	[A]		[A]
std	0.6342		0.9092	0.4082	0.2357		0.3299		0.1414	
ev	1	1.189771	12	48	02	0.169967	83	0.124722	21	0.094281
SIT										
E 4	7.7	11.1	5.6	6.6	3.1	2.3	2.2	1.8	1.2	1
	8.2	7.7	6.6	6.9	3.6	2.2	1.9	1.6	1.4	1
	8.9	8.6	7.4	6.3	3.5	3.5	2.1	1.5	1.6	0.8
me	8.2666	9.133333	6.5333			2.666667	2.0666	1.633333		0.933333
an	67[D]	[D]	33[D]	6.6[D]	3.4[A]	[A]	67[A]	[A]	1.4[A]	[A]
std	0.4921		0.7363	0.2449	0.2160		0.1247		0.1632	
ev	61	1.438363	57	49	25	0.590668	22	0.124722	99	0.094281
SIT										
E 5	6.6	9.6	5.4	6.5	3.1	1.2	2.6	0.8	1.5	0.3
	7.2	9.1	5	6.1	3	1.8	2	1.1	1.2	0.9
	7.8	7.9	5.2	5.8	3.2	1.9	1.6	1	0.8[A]	0.5[A]
Me		8.866667		6.1333		1.633333	2.0666	0.966667	1.1666	
an	7.2[E]	[E]	5.2[E]	33[E]	3.1[A]	[A]	67[A]	[A]	67	0.566667
Std	0.4898		0.1632	0.2867	0.0816		0.4109		0.2867	
ev	98	0.713364	99	44	5	0.309121	61	0.124722	44	0.249444

Key: results are mean values of duplicates ± standard deviation; Means that do not share a letter are significantly different

Table 3:3MORPHOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF BACTRIA ISOLATES

Table 3.3 shows the morphological characteristics of the bacteria isolated. The bacteria isolated were *P. vulgaris, P. mirabillis, S.fecalis, E.coli, Shigella, Salmonella* and *Klebsiella species.* They were identified using cultural methods and their biochemical reactions

K	**Morphology**	**Gram rxn**	**CAT**	**COA**	**OXI**	**MOT**	**IND**	**CIT**	**VP**	**MR**	**HEMOLYSIS REACTION**	**Suspected organismn**
A	Round, moist, elevated pale colonies on macconkey agar	-ve rods	+	-	-	-	-	-	-	+	B	*Shigella* species

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B	Non lactose fermenting colonies with black centres on MacConkey agar.	-ve rods	+	-	-	+	-	-	-	+	B	*Salmonella* species
C	Colorless swarming colonies seen on nutrient agar	-ve rods	+	-	-	+	+	+	-	+	A	*Proteus vulgaris*
D	Colorless swarming colonies seen on nutrient agar	-ve rods	+	-	-	+	-	+	+	-	B	*Proteus mirabilis*
E	Round small colonies, shinny surfaces that are pale pink in colour on Mac. .agar.	+cocci	+	-	-	-	-	+	-	+	A	*Streptococcus. Fecalis*
F	Large whitish mucoid elevated round colonies,with smooth shinny surfaces.	-ve rods	+	-	-	-	-	+	+	-	B	*Klebsiella* species
G	Small, pinkish colonies, with shinny surfaces, elevated and moist on MacConkey agar.	-ve rods	+	-	-	-	+	+	-	+	A	*Escerichia coli*
H	Small yellow colonies, that are round, smooth and elevated on nutrient agar	+ve cocci	+	+	-	-	-	+	+	-	B	*Staphylococcus aureus*
I	Small yellowish white colonies, that are round smooth and elevated. On N.A.	+ve cocci	+	-	-	-	-	-	+	-	A	*Staphylococcus epidermidis*

Key: cat-catalase; coa- coagulase; oxi-oxidase; mot-motility; ind-indole; cit-citrate; VP-vogues prokeur; rxn-reaction, - negative,+ positive; α/ β – alpha/beta hemolysis

Figure 1and 2 shows the moisture content, temperature and pH of the roasted chicken and bush meat. The moisture content of the chicken samples ranged from 86-95(%) while the bush meat had a moisture content of 83-88(%).

The pH on the chicken sample ranged from 6.5-7.7 while the bush meat had a pH value range of 6.8-7.4. the temperature had arrange of 30-38(^{o}C), while the bushmeat had a temperature range of 33-54(^{o}C).It was observed that the higher the temperature the lower the moisture content and pH.

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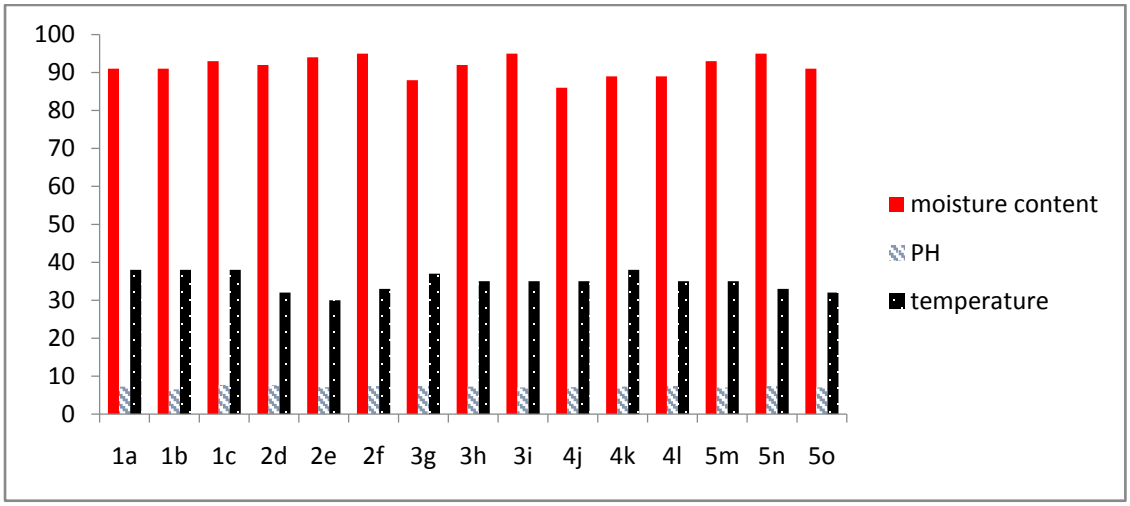

Figure 1: moisture content, pH, Temperature of the roasted chicken samples

KEY: Site 1 – Afikpo, Site 2 – Amasiri, Site 3 – Oziza, Site 4 – Unwana, Site 5 – Enohia.

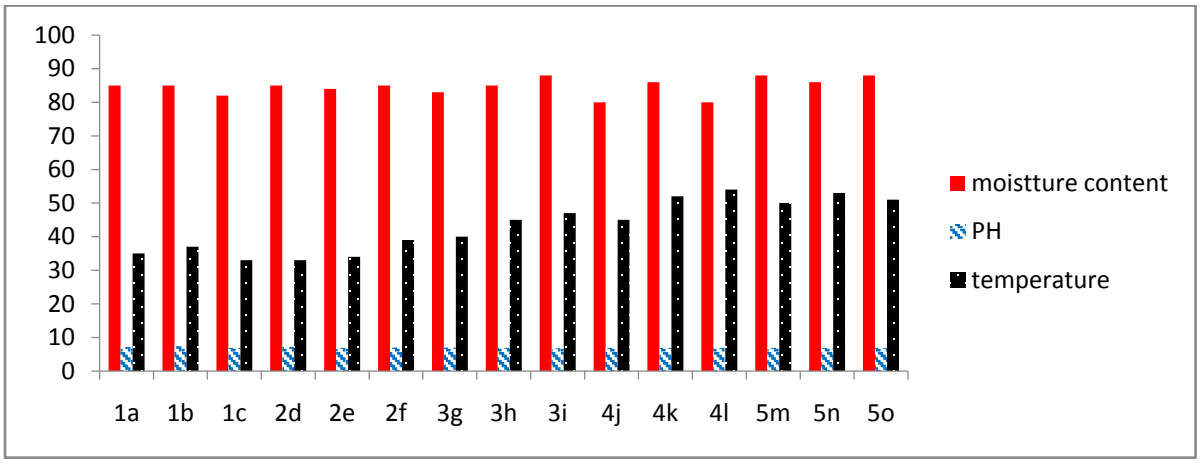

Figure 2: moisture content, pH, Temperature of the roasted bush meat samples

KEY: Site 1 – Afikpo, Site 2 – Amasiri, Site 3 – Oziza, Site 4 – Unwana, Site 5 – Enohia

Table 3.4 shows the occurrence of the bacteria isolated from bush meat at different sites. Results showed that *S.aureus, S.epidermidis* and *E.coli* (100% each) had the highest occurrences while Salmonella species (33.3) was the least

Table 3.4:OCCURRENCE OF THE BACTERIA ISOLATED FROM BUSHMEAT AT DIFFERENT SITES

BACTERIA USED FOR STUDY	Afikpo			Amasiri			Oziza			Uwana			Enohia			Occurrence
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	(%)
S. aureus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)
S. epidermidis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)
Escherichia coil	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)

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K. pneumonia	+	+	+	+	+	+	-	-	-	+	+	-	-	-	-	8(53.3)
Shigella species	-	-	+	+	+	-	+	-	+	+	+	-	+	+	-	9(60)
Salmonella species	-	-	+	-	-	+	-	+	-	-	-	+	-	+	-	5(33.3)

Key:

- Absent+ PresentS *Staphylococcus*K *Klebsiella*

A- O Samples of bush meat

Table 3.5 shows the occurrence of the bacteria isolated from chicken at different locations**.** Results showed that *S. aureus, S. epidermidis* and *E. coli* (100% each) had the highest occurrences while *P. vulgaris* (13.3) was the least

Table 3.5:OCCURRENCE OF THE BACTERIA ISOLATED FROM CHICKEN FROM DIFFERENT LOCATIONS

BACTERIA USED FOR STUDY	Afikpo			AmasirI			Oziza			Uwana			Enohia			Occurrence (%)
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
S. aureus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)
S. epidermidis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)
Escherichia coil	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	15(100)
S. fecalis	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	12(80)
K. pneumonia	-	+	-	+	+	-	-	+	-	+	+	-	-	-	-	6(40)
Proteus Vulgaris	+	+	-	-	-	-		-	-	-	-	-	-	-	-	2(13.3)
P.mirabilis	+	+	-	+	-	-	+	-	-	+	-	-	-	-	-	5(33.3)
Shigella species	+	+	+	+	+	+	-	+	-	+	+	+	-	-	-	10(66.7)
Salmonella species	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	13(86.7)

Key: -Absent, + Present, S *Staphylococcus*, K *Klebsiella*, A- O Samples of bush meat

Figure 3 shows the comparative studies of the occurrence of the bacteria isolated on the different sites. It was observed that the bacteria occurred more on the roasted chicken samples than on the roasted bush meat samples.

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However, *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Escherichia coli* had the same occurrences on both the roasted chicken and bush meat samples.

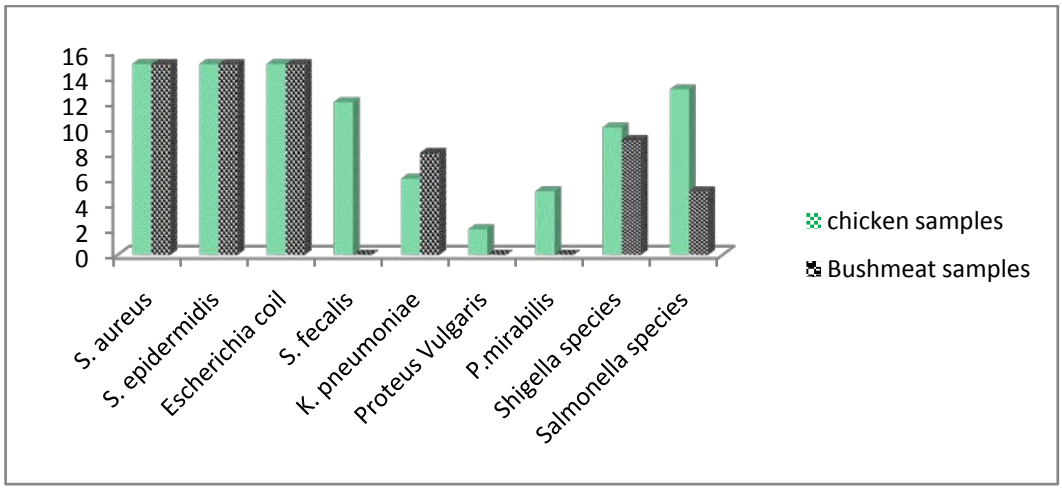

Figure 3: comparative analysis of the occurrence of bacteria on chicken and bush meat samples

Table 3.6. shows that the antibiogram was done by determining the percentage of sensitivity or resistivity shown by the individual isolates.it was observed that *S.aureus* isolated from the chicken were most sensitive to Perfloxacin(100%) and Ciprofloacin(100%) having all the *S. aureus* isolated being sensitive to them but they were resistant to Ampiclox (100%).

S. aureus from the bush meat showed 100% sensitivity to ciprofloxacin, Ampicillin, Ampiclox, Perfloxacin and Streptomycin, but showed highest resistance of 46.7% Erythromycin.

Table 3.6 : Antibiogram of Staphylococcus aureus

Antimicrobial Agent	**Chicken samples (n=15)**			**Bushmeat samples (n=15)**		
	Resistant	**Intermediate**	**Sensitive**	**Resistant**	**Intermediate**	**Sensitive**
CPX	0(0)	0(0)	15(100)	0(0)	0(0)	15(100)
AM	7 (46.7)	2(13.3)	6(40)	0(0)	0(0)	15(100)
APX	15 (100)	0(0)	0(0)	0(0)	0(0)	15(100)
E	0 (0)	2(13.3)	13(86.7)	7(46.7)	3(20)	5(33.3)
CN	3(20)	3(20)	9(60)	2(13.3)	0(0)	13(86.7)
PEF	0 (0)	0(0)	15(100)	0(0)	0(0)	15(100)
SXT	5(33.3)	2(13.3)	7(46.7)	5(33.3)	0(0)	10(66.7)
S	0(0)	2(13.3)	13(86.7)	0(0)	0(0)	15(100)
R	0(0)	0(0)	15 (100)	4(26.7)	1(6.7)	10(66.7)
Z	9 (60)	6(40)	0 (0)	2(13.3)	0 (0)	13(86.7)

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N=number of isolates; CPX=Ciprofloxacin;APX-Ampiclox;AM-Ampicillin;E-Erythromycin;CN-gentamycin;PEF-Perfloxacin;SXT-septrin;S-streptomycin;R-Rifampicin;Z-Zinaced

Table 3.7 shows the antibiogram of *staphylococcus epidermidis*. From the chicken samples, *Staphylococcus epidermidis* showed highest sensitivity to Ciprofloxacin (100%) but was highly resistant to Ampiclox (100%), Rifampicin (100%) and Erythromycin(100%) while *S.epidermidis* isolated from the bush meat also showed highest resistance with Erythromycin (46.7%) but showed highest sensitivity to ciprofloxacin, Ampiclox, Perfloxacin and Streptomycin each having a 100%.

Table 3.7: Antibiogram of Staphylococcus epidermidis

Antimicrobial Agent	**Chicken samples (n=15)**			**Bushmeat samples (n=15)**		
	Resistant	**Intermediate**	**Sensitive**	**Resistant**	**Intermediate**	**Sensitive**
CPX	0(0)	0(0)	15(100)	0 (0)	0(0)	15(100)
AM	2 (13.3)	0(0)	13(86.7)	5(33.3)	0(0)	10(66.6)
APX	15 (100)	0(0)	0(0)	0(0)	0(0)	15(100)
E	15 (100)	0(0)	0(0)	7(46.7)	0(0)	8(53.3)
CN	0(0)	2(13.3)	13(86.7)	2 (13.3)	0(0)	13(86.7)
PEF	0 (0)	2(13.3)	13(86.7)	0(0)	0(0)	15(100)
SXT	13(86.7)	2(13.3)	0(0)	5(33.3)	0(0)	10(66.7)
S	2(13.3)	1(33.3)	0(0)	0(0)	0(0)	15(100)
R	0(0)	0(0)	15 (100)	5(33.3)	0(0)	10(66.7)
Z	0 (0)	15(100)	0 (0)	3 (20)	0(0)	12 (80)

N=number of isolates; CPX=Ciprofloxacin;APX-Ampiclox;AM-Ampicillin;E-Erythromycin;CN-gentamycin;PEF-Perfloxacin;SXT-septrin;S-streptomycin;R-Rifampicin;Z-Zinaced

Table 3.8 shows the antibiogram of *E.coli*. From the chicken samples, *E.coli* showed highest sensitivity to Ciprofloxacin (100%) but 8 were highly resistant to Ampicillin (53.3%), while *E.coli* isolated from the bush meat also showed highest resistance with Septrin 2(13.3%) but showed highest sensitivity to Ofloxacin, Augmentin, chloramhenicol, sparfloxacin and Perfloxacin, each having a 100%.

Table 3.8: Antibiogram of *Escherichia coli*

Antimicrobial agent	**Chicken (n=15)**			**Bushmeat (n=15)**		
	Resistant	**Intermediate**	**Sensitive**	**Resistant**	**Intermediate**	**Sensitive**
CPX	0(0)	0(0)	15 (100)	0(0)	2(13.3)	13(86.7)
S	9(60)	0 (0)	6 (40)	0(0)	5(33.3)	10(66.7)
SXT	9(60)	0(0)	6(40)	2(13.3)	2(13.3)	11(73.3)
PEF	0(0)	2(13.3)	13 (86.7)	0(0)	0(0)	15(100)
CN	7 (46.7)	2(13.3)	6 (40)	0(0)	3(20)	12(80)
AM	8(53.3)	0 (0)	7(46.7)	0(0)	4(26.7)	11(73.3)

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CH	6(40)	0 (0)	9(60)	0(0)	0(0)	15(100)
OFX	0(0)	6(40)	9(60)	0(0)	0(0)	15(100)
SP	0(0)	8(53.3)	7(46.7)	0(0)	0(0)	15(100)
AU	3(20)	0(0)	12(80)	0(0)	0(0)	15(100)

N=number of isolates; CPX=Ciprofloxacin;OFX-Ofloxacin;AM-Ampicillin;AU-Augmentin;CN-gentamycin;PEF-Perfloxacin;SXT-septrin;S-streptomycin;CH-chloramphenicol, SP-Sparfloxacin

I thereby recommend that the sellers should be **Recommendation**

Educated by the health officers on the risk involved in the poor hygienic practice in preparing and exposing these meats.

IV. CONCLUSION

This study therefore show that improper hygienic practices and exposure of roasted chicken and meat popularly sold in some areas of Ebonyi state poses a public health threat to the consumers. There is therefore need to enlighten the sellers, since most of the species are antibiotic resistant, to properly prepare and display these meats for sale to avoid contamination.

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