MICROBIAL ANALYSIS AND ANTIBIOGRAM OF BACTERIA AND FUNGI ISOLATED FROM MEAT SELLERS TABLES IN DUTSIN-MA METROPOLIS, KATSINA STATE.

Abstract

The research work was carried out in order to determine the microbial analysis and antibiogram of bacteria and fungi isolated from meat seller tables in dutsin-ma metropolis. A total of 20 samples were used for this study. Swab sticks were used to collect 2 samples each from each table from five different spot at Wednesday market and Darawa. The samples were then transported to the microbiology laboratory department of Federal University, Dutsin-ma for analysis. MacConkey agar, nutrient agar, mannitol salt agar, bile esculin agar, salmonella-shigella agar, eosin methylene blue agar and potatoes dextrose agar was used first for the isolation of the bacteria and fungi. Gram staining and biochemical tests were also carried out in order to identify the bacteria species and lacto phenol cotton blue stain was used to identify the fungi microscopically. The isolates were gram negative rod/cocci shaped bacterium and gram positive cocci/rod shaped bacterium. For biochemical, Oxidase, citrate, urease, motility, coagulase, Indole, catalase, Methyl red and Voges-Prokauer were all negative and positive. Antimicrobial susceptibility test results showed that the isolate is highly susceptible to some antibiotic which are Esherichia coli, salmonella specie, klebsella pneumonia, bacillus subtilis, streptococcus specie and staphylococcus aureus. Investigations from this finding shows that research from this study, therefore shows that meat seller table are highly contaminated. Recommendation shows that good hygiene practice should be encouraged, government should create awareness to the public on the dangers of foodborne illness, proper washing and cooking of the meat should be encouraged, meat sellers should ensure standard hygiene practices and ethics in the selling of their meat product, further research is encouraged to be conducted to discover more microbial contaminates on the meat seller tables.

Comment [H1]: writing in italics ex: *Escherichia coli, Salmonella sp*

1. Introduction

Ensuring the safety and quality of food, particularly meat products, is of utmost importance to safeguard public health. One significant concern in the food industry is the presence of microbial

contamination, which can lead to foodborne illnesses and economic losses. The surfaces where meat is handled and sold, such as meat seller tables, are potential sources of microbial contamination. Conducting a microbial analysis of bacteria and fungi isolates from meat seller tables is crucial in assessing the hygiene conditions of these surfaces and understanding the associated risks. By studying the microbial composition and prevalence on these tables, researchers can gain insights into the presence of harmful microorganisms, evaluate the overall cleanliness, and identify potential sources of contamination. A number of bacteria species, including coliforms and Listeria can be present in the Intestines of some humans and animals, including birds without causing infection (Ramaswany 2007). Hence, listeria is could be transmitted through water bodies contaminated by abattoir effluent.

Bacteria and fungi are the primary groups of microorganisms found on meat seller tables. Bacteria exhibit diverse characteristics, including both beneficial and harmful species. Harmful bacteria, such as Salmonella, Escherichia coli, and Staphylococcus aureus, can cause foodborne illnesses when consumed. Fungi, including molds and yeasts, can also grow on these surfaces and may produce toxins that pose health risks. Understanding the microbial diversity and prevalence on meat seller tables is essential for implementing effective control measures to reduce contamination and ensure food safety. By identifying specific microorganisms and their susceptibility to antimicrobial agents, appropriate strategies for sanitation and hygiene can be developed and implemented to minimize the risk of foodborne illnesses.

Fungi are widely distributed in nature and can occur as unicellular yeast or filamentous and, multicellular molds. Despite their wide occurrence, little attention has been given to their presence and significance to the environments (Kirk 2001). In 1980s and 1990s, more cases of health problems caused by fungal contamination.

By gaining insights into the microbial profile of meat seller tables, various stakeholders in the food industry, including regulatory authorities, food producers, and consumers, can make informed decisions regarding food safety practices, inspections, and appropriate interventions to mitigate the risks associated with microbial contamination.

Microbial analysis of bacteria and fungi isolates specifically from meat seller tables presents a knowledge gap in understanding the associated risks and ensuring the safety and quality of meat.

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Microbial contamination on meat seller tables can result from inadequate sanitation practices, improper storage of meat, and cross-contamination with other surfaces. These factors increase the likelihood of foodborne illnesses among consumers. To effectively manage these risks, a thorough investigation of the microbial contaminants is necessary. Despite the significance of this issue, there is a notable lack of comprehensive research on the microbial profile of bacteria and fungi isolates specifically from meat seller tables. By investigating the extent of contamination, identifying the antibiotics to which the bacteria and fungi are resistant, and assessing their potential for multi-drug resistance.

The microbial analysis of bacteria and fungi isolates from meat seller tables is a topic of significant relevance to the society. The safety of meat as a perishable food product is a major concern, considering that it can harbor various microorganisms that may pose health risks to consumers.

This study will be useful in the following; Ministry of Health- Foodborne illnesses continue to be a pressing public health issue worldwide, with potentially severe consequences for vulnerable populations. Identifying and understanding the microbial contaminants on meat seller tables can help pinpoint possible sources of contamination, contributing to the prevention of foodborne diseases and protecting public health.. Good hygiene practice - this research can also provide valuable insights into the hygiene practices followed by meat sellers in handling and maintaining their selling surfaces. By uncovering possible lapses in sanitation and hygiene measures, the study can promote awareness and education among meat sellers, encouraging them to adopt better practices and minimize the risk of cross-contamination. Food industries- this research can play a role in quality control efforts in food industry, regulatory bodies and industry stakeholders can use the findings to assess and improve food safety protocols in the meat supply chain, ensuring the safety and integrity of meat products reaching consumers.

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2.0 Material and method

2.1 Study area

The study will be conducted in Dutsin-ma Local Government area of Katsina State. Dutsin-ma LGA has an area of 527 square kilometers and a population area of 169,671 as at 2006 census. The people of the area are mostly farmers and herdsmen, others do engage in commercial

activities and government work. The inhabitant of this locality mostly consumed different food product, the different food product includes: rice, beans, cereal and meat product.

2.2 Sample size

Atotal of 20 samples were collected from 2different locations within the study area.

2.3 Samplecollection

Permission was granted from meat sellers to access their selling areas. A representative sample of meat seller tables was selected from different locations including the markets. A sterile swabs stick was used to collect samples from the table surface. The surfaces of the meat seller's bench were swab using a sterile swab sticks from different spots in dutsin-ma metropolis. Two samples from each meat bench of five meat seller of the same location include Wednesday market and Darawa meat spots. This procedure was repeated for all the samples that were collected on different occasions in all the locations. The swabs were placed in a sterile transport medium (peptone water) in order to keep sterilethe swab samples, to maintain the viability of the bacteria during transportation to the laboratory. The samples were stored at appropriate temperature (usually refrigerated) until testing.

2.4 Media Preparation and Inoculation

All microbiological media were prepared according to the directions of the manufacturer's instructions. The media include: Nutrients agar, MacConkey agar, potatoes dextrose agar, Mannitol salt agar, Bile esculin agar, Salmonellla Shigella agar, and Eosin methylene blue agar. [Oyeleke 2008].

The samples collected were inoculated on the prepared media by streak plate method after which an initial smear was made and then the primary, secondary and tertiary streaking was made and incubated.

2.5 Isolation and identification of fungi

Fungal was identified by examining both macroscopic and microscopic character. The identification was aided by using identification of Barnett [Adwards 1972]. Two drops of lacto phenol cotton blue reagents were dropped on a clean glass slide, a specimen was placed on the

Comment [H5]: The location points need to be included and why you chose that location needs to be given a little explanation

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stain and was pressed gently for it to mix, a cover slip was held between the fore fingers and thumb, it was used to touch one edge of the drop to mount with cover slip edge, and was lowered gently avoiding air bubbles. It was mounted for viewing on the microscope at X 40 objective lens. Presumptive spores and hyphae for fungal will appear as pale to dark blue.

2.6 Isolation and Identification of bacteria Isolates

2.6.1 Colony characterization

Bactria isolates were identified on the basis of cultural morphology which include the texture,

Edge, pigmentation, consistency, shape, topography and size

Comment [H8]: Literature books need to be included as references such as the Bergey manual of bacteriology

2.7 Gram Staining

A drop of water was added to a clean glass slide, the pasture loop was used to pick a colony from a plate, it was emulsified to form a smear. It was air dried and heat fixed, it was taking to the staining rack for staining. The crystal violet was added as the primary stain for 30 – 60 seconds, it was rinsed with water and decanted, and gram's iodine was added about 30 – 60 seconds as a mordant so that the crystal violet could penetrate the organisms it was rinsed and decanted. Alcohol was added as a decolorizer for 5 – 15 seconds to wash away the primary dye, if it is not a gram-positive bacterium, then the safranin was added as the counter stain for 30 – 60 seconds and then rinsed and decanted. It was blotted dried and a drop of oil immersion was added to view under the microscope at X 100 objective lens

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Blue or purple background indicates a gram-positive bacterium.

Pink or red background indicates a gram-negative bacterium.

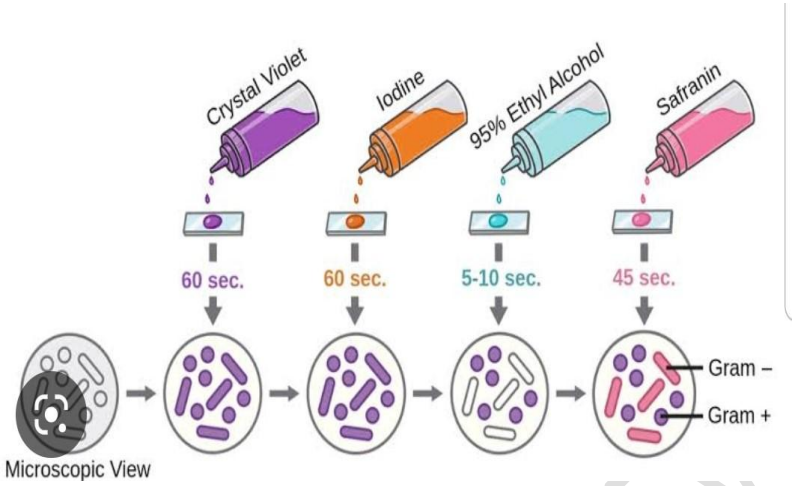

Fig 1. Observation under Gram Staining

2.8 Biochemical tests

Biochemical test is test that are performed on different bacteria for their identification on the basics of their biochemical activities towards different Gram positive and Gram negative bacteria requires biochemical test for the identification of the species of organism.

2.8.1 Oxidase test

A loop-full of oxidase reagent was place on a filter paper in a petri dish, using plastic wire loop a colony of the organism was smeared across the wetted filter paper. Then deep purple color appearance indicates positive result and no deep purple coloration indicate negative result (Abiola and Oyetayo 2016).

2.8.2 Citrate test

Citrate agar is used to test an organism's ability to utilize citrate as a source of energy. When the bacteria metabolize citrate, the ammonium salts are broken down to anomia which increase alkalinity. The shift in PH turns the bromothymol blue indicator in the medium from green to blue above PH the medium turns blue, the organism is citrate positive, if there is no color change that is it remains green the organism is citrate negative. (Abiola and Oyetayo 2016)

2.8.3 Catalase test

Two drop of hydrogen peroxide was placed on a free grease slide. Then a colony of the organisms was transferred and emulsified in hydrogen peroxide on a clean free grease glass slide. Gas bubbles indicated positive reaction and no bubbles indicate negative reaction). (Abiola and Oyetayo 2016)

2.8.4 Urease test

Urease test is use to identify those organisms that are capable of hydrolyzing urea to produce ammonia and carbon dioxide. Urease production is indicated by a bright pink color on the slant in which the result is positive and no bright pink color indicates negative. (Abiola and Oyetayo 2016)

2.8.5 Motility

Motility is used to test an organism ability to move. The ability of the organism inoculated to swim away from the point of inoculation shows the organism is motile that is presence of turbidity, the ability of the organism inoculated that do not swim from the point of inoculation shows that the organism is non-motile.

2.8.6 MRVP (Methyl red/Voges – Proskaues)

The test MRVP is used to determine which fermentation pathway is used to utilize glucose. In the mixed acid fermentation pathway, glucose is fermented and produces organic acid. The test bacteria are grown in broth medium containing glucose. If the bacteria has the ability to utilize glucose with production of stable acid, the color of the methyl red changes from yellow to red when added into the broth culture

2.8.7 Coagulase test

Two drop of citrated plasma was placed on a free grease slide. Then a colony of the organisms was transferred and emulsified on the glass slide. Agglutination or clumping indicates positives and no agglutination or clumping indicates negatives result.

2.8.8 Indole test

Indole test screens for the ability of an organism to degrade the amino acid tryptophan and produce indole. Detection of indole is based on the chemical reaction between indole and kovac's reagent the appearance of a pink ring indicates indole positive.

2.9 Antibiotic Susceptibility test

Antibiogram of the test isolates was determined using disc diffusion technique and Monica 2006]. Each colony of the test isolate was picked with a wire loop and inoculated into nutrient broth and incubated for 3hours. The turbidity of each broth culture was adjusted to correspond to 0.5 McFarland turbidity standards (corresponding to approximately 108cfc/ml). Each standardized broth culture was used to inoculate the surface of the Mueller-Hinton (MH) agar plates and the excess fluid drained into disinfectant jar. The surface of each inoculated plate was allowed to dry. Using a disc dispenser, the antibiotic discs was aseptically placed on the surface of the inoculated agar plates and then incubated for 24hrs at 37 degrees. After incubation, the plates were examined for zones of inhibition round each disc. The diameters of the zones of inhibition were measured with a meter rule and recorded.

Comment [H10]: the reference needs to be mentioned as a reference for example CLSI

3.0 Results

3.1 Cultural morphology and microscopic characteristics of fungi isolates

Results of findings from the investigations carried out on potatoes Dextrose agar showed various colony morphology of different fungal specie. Most of the growths on the plates were olive and dark greenish, smooth with white edges and spongy surfaces; others had cottony surfaces with black colorations. The microscopic examination further revealed the presumptive identities of the isolates. Four different fungi species has been isolated in the study sites the most prevalence is *Aspergillus niger* with the percentage of 40% from the ten sample and the less prevalence is *Aspergillus fumigatus* with the percentage of 10% from the ten samples. The results are presented in Table 1

3.2 Distribution of Bacteria cultural characteristics based on the media used

Table 2 showed the various distributions of bacteria isolates based on the media used and the colony characterization. The characterization was read based on the size, shape, texture, color, and topography. Growths on macConkey agar were circular, creamy, opaque and translucent. Colony morphology on salmonella-shigella agar was circular, large, smooth, and translucent with moist edge.

3.3 Distribution of bacteria isolates based on their gram reaction and biochemical tests

Microscopic examination and biochemical tests results revealed the gram reaction of the bacteria. The gram positive isolates were three in number and they include *Bacillus subtilis*, *Staphylococcus aureus* and *Streptococcus spp*while gram negative isolates were three which are *Escherichia coli*, *Salmonella spp* and *Klebsella pneumonia*. The results are showed in Table 3

3.4 Results of Antimicrobial susceptibility test pattern for (Gram positive Bacteria)

Table 4 showed the distribution of antimicrobial tests pattern for gram positive bacteria *Staphylococcus aureus* was susceptible to Ciprofloxacin, Streptomycin, Septrin, and resistance to Pefloxacin, Gentamycin, Ampiclox, zinnacef, Amoxacillin, Rocephin, and Erythromycin. *Bacillus specie* was resistance to Ampiclox, Amoxacillin, Septrin, and Erythromycin. Streptococcus specie was susceptible to Pefloxacin, Gentamycin.

3.5 Results of Antimicrobial susceptibility test pattern for (Gram negative Bacteria)

Table 5 showed the distribution of antimicrobial tests pattern for gram negative bacteria *Escherichia coli* was susceptible to Septrin, Ciprofloxacin, Pefloxacin, Tarivid, Streptomycin; Intermediate to Chloramphenicol, Sparfloxacin, Gentamycin and Resistant to Amoxacillin, Augmentin. *Salmonella specie* was susceptible to Sparfloxacin, Ciprofloxacin, Gentamycin and Streptomycin. *Klebsella pneumonia* is resistance to Chloramphenicol, Sparfloxacin, Ciprofloxacin, Amoxacillin, Augmentin, Pefloxacin and Streptomycin.

Table 1. Cultural morphology and microscopic characteristics of fungi isolates

Sample	Colony morphology	Microscopic characteristics	Presumptive isolates

code			
A1	olive green, white edge, and granular surfaces	thick walled, conidospore with hyaline and long, aseptate shape	*Aspergilus flavus*
A2	Black, white edges and spongy surfaces	long conidospore with smooth walled hyaline	*Aspergilusniger*
A3	Dark green, white edges and spongy surfaces	Long and narrow conidospore with wall hyaline	*Aspergilus fumigatus*
A4	Black, white edges and spongy surfaces	long conidospore with smooth walled hyaline	*Aspergilusniger*
A5	cottony surface and brown in coloration	Dark mycellum hyaline, no septation of branches set off from the main hyphae	*Oidiodendron griseum*
W1	olive green, white edge, granular surfaces	thick walled, conidospore with hyaline and long, aseptate shape	*Aspergilus flavus*
W2	Black, white edges and spongy surfaces	long conidospore with smooth walled hyaline	*Aspergilusniger*
W3	Cottony surface and brown in coloration	Dark mycellum hyaline, no septation of branches set off from the main hyphae	*Oidiodendron griseum*
W4	Olive green, white edge, granular surfaces	thick walled, conidospore with hyaline and long, aseptate shape	*Aspergilus flavus*
W5	Black, white edges and spongy surfaces	long conidospore with smooth walled hyaline	*Aspergilusniger*

Key:

A1= Sample 1 from Darawa, A2= Sample 2 from Darawa, A3=Sample 3 from Darawa, A4= Sample 4 from Darawa, A5= Sample 5 from Darawa, W1=Sample 1 from Wednesday market, W2=Sample 2 from Wednesday market, W3= Sample 3 from Wednesday market, W4= Sample 4 from Wednesday market, W5= Sample 5 from Wednesday market

Table 2. Distribution of Bacteria cultural characteristics based on the media used

Media	Colony characterization
Eosin methylene blue agar	Pinpoint, flat, round greenish metallic sheen, smooth, slightly raised and translucent
Nutrient agar	Irregular, creamy, opaque, entire mucoid small, translucent, small, round, white, rough,
Salmonella-Shigella agar	Circular, large, smooth, translucent, grey white, moist, entire edge and opacity
Mannitol Salt agar	Small, round, flat, yellowish, firm, translucent and opaque
Bile eculin agar	Mucoid, smooth, translucent, greyish white, round and large
MacConkey agar	Circular, creamy, opaque, dry, small and translucent

Table 3. Distribution of bacteria isolates based on their gram reaction and biochemical tests

Sample	Gram reaction	Oxidase	Citrate	Catalase	Urease	Motility	MR	VP	Coagulase	Indole	IDENTIFIED ORGANISM
A1	-	-	-	+	-	+	+	-	-	+	*Escherichia coli*
A1i	-	-	+	+	-	+	-	+	-	-	*Salmonella spp*
A2	+	-	-	+	-	-	-	+	-	-	*Bacillus subtilis*
A2i	+	-	-	+	+	+	-	-	+	+	*Staphylococcus aureus*
A3	+	+	-	-	-	-	+	-	-	+	*Streptococcus spp*
A3i	+	-	-	+	+	+	-	-	+	+	*Staphylococcus aureus*
A4	-	-	+	+	-	+	+	-	-	-	*Salmonella spp*
A4i	-	-	+	+	-	-	+	-	-	+	*Klebsella pneumonia*
A5	+	-	-	+	+	+	-	-	+	+	*Staphalococcus aureus*
A5i	+	-	-	+	-	-	-	+	-	-	*Bacillus subtilis*
W1	-	-	+	+	-	+	+	-	-	-	*Salmonella spp*
W1i	-	-	-	+	-	+	+	-	-	+	*Escherichia coli*
W2	+	-	-	+	+	+	-	-	+	+	*Staphlococcus aureus*
W2i	+	+	-	-	-	-	+	-	-	+	*Streptococcus spp*
W3	-	-	+	+	-	-	+	-	-	+	*Klebsella pneumonia*
W3i	-	-	+	+	-	+	+	-	-	-	*Samonellaspp*
W4	+	-	-	+	-	-	-	+	-	-	*Bacillus subtilis*
W4i	+	+	-	-	-	-	+	-	-	+	*Streptococcus spp*

W5	-	-	-	+	-	+	+	-	-	+	*Escherichia coli*
W5i	-	-	+	+	-	+	+	-	-	-	*Salmonella spp*

KEY

MR=Methyl red, VR=Voges-Proskauer

Table 4. Results of Antimicrobial susceptibility test pattern for (Gram Negative Bacteria

Bacteria	SXT	CH	SP	CPX	AM	AU	CN	PEF	OFX	S
Escherichia coli	22(S)	12(I)	18(I)	26(S)	0(R)	0(R)	12(I)	30(S)	26(S)	20(S)
Salmonella spp	0(R)	0(R)	25(S)	30(S)	13(I)	0(R)	20(S)	0(R)	0(R)	22(S)
Klebsella pneumonia	13(I)	0(R)	0(R)	8(R)	0(R)	0(R)	21(S)	0(R)	30(S)	8(R)

Key

SXT=Septrin, CH=Chloramphenicol, SP=Sparfloxacin, CPX=ciprofloxacin, AM=Amoxacillin, AU=Augmentin, CN=gentamycin, PEF=pefloxacin, OFX=Tarivid, S=Streptomycin

CLSI Standard R=Resistance (1-12), I=Intermediate (13-17), S=Susceptible(18-above)

Table 5. Results of Antimicrobial susceptibility test pattern for (Gram Negative Bacteria)

Bacteria	SXT	CH	SP	CPX	AM	AU	CN	PEF	OFX	S
Escherichia coli	22(S)	12(I)	18(I)	26(S)	0(R)	0(R)	12(I)	30(S)	26(S)	20(S)
Salmonella spp	0(R)	0(R)	25(S)	30(S)	13(I)	0(R)	20(S)	0(R)	0(R)	22(S)
Klebsella pneumonia	13(I)	0(R)	0(R)	8(R)	0(R)	0(R)	21(S)	0(R)	30(S)	8(R)

Key:

SXT=Septrin, CH=Chloramphenicol, SP=Sparfloxacin, CPX=ciprofloxacin, AM=Amoxacillin, AU=Augmentin, CN=gentamycin, PEF=pefloxacin, OFX=Tarivid, S=Streptomycin

4.0 Discussion, Conclusion and Recommendations

4.1 Discussion

During the research investigation, 20 samples were collected, out of the 20 samples that were collected all were positive and six organisms were isolated from the bacteria. Sample A showing growth on Eosin methylene blue, greenish metallic sheen and a rod shape in chain and was confirmed thoroughly using different biochemical test.

Comment [H11]: needs to be added to the discussion about the characteristics of bacteria discovered by existing research in journals or other literature

Organisms were isolated based on colony characteristics and biochemical tests. The present study revealed that all of the isolates from commercial meat seller tables were resistance to multiple antibiotics which coincided with the findings of Zhao *et al.* (2005), Guerra et al. (2003) and Islam *et al.* (2008). Multiple antimicrobial resistance might have happened due to indiscriminate use of antibiotics, chemotherapeutics and or disperse of drug resistant microorganism in the environment (Van de Boogard and Stobberingh, 2000).

Comment [H12]: The incidence of resistance to antibiotics also needs to be analyzed and discussed about the effects and dangers

The findings of these investigations are therefore in conformity with that of Bankole *et al.* (2005) who reported the presence of *S. auerus, Bacillus species, E. coli, Pseudomonas species, Saccharomyces species, Rhizopus species and Aspergillus species* in the palms of food vendors in Abeokuta Metropolis, Ogun State, Nigeria. Findings from this study revealed that meat seller tables from Wednesday market was the most contaminated, whereas Darawa meat spots was less contaminated. Interestingly, findings from this study indicate higher bacterial counts that had contaminations as a result of poor hygiene by the meat sellers and the abattoir. This study further revealed that swab samples obtained from the various meat seller tables in the selected locations in dutsin-ma are contaminated with both bacteria (*Escherichia coli, Klebsiella pneumonia, Bacillus subtilis, Salmonella spp., Staphylococcus aureus, and Streptococcus specie*) and fungi (*Aspergilusniger, Aspergilus flavus, Aspergillus fumigatus*) and *Oidiodendrongrisum*. Contaminations of meat seller tables swab for this study may occur from two major sources, namely, primary and secondary sources: primary source of contamination may be as a result of

activities of animals that include, but not limited to, secretion and excretion, whereas secondary source of contamination may stem from infected humans, contaminated water and equipment, and poor pre- and post-slaughter handling of animals (Marriot, 2004). There is therefore a certainty that the beef was contaminated at the time when even healthy animals were slaughtered and eviscerated at the abattoir or at the meat retail shops. These notwithstanding, there is also the possibility that:(i) the slaughtered animals may have been contaminated with potential pathogenic and spoilage bacteria that resided in the hide, gastrointestinal and respiratory tract and (ii) the animals slaughtered and eviscerated on the floor had a high risk of bacterial contamination (Sofos*et al.*, 1999). It suffices to suggest then that the types of microbial contamination and the extent of spoilage of meats depend largely on sanitation procedures and hygienic practices employed during meat handling, processing, transportation, distribution, and storage, which invariably may have damning implications for public health (Adu-Gyamfi *et al*., 2012; Ercolini *et al*., 2006; Komba *et al.*, 2012; Kivi *et al*., 2007; Li *et al.*, 2006).

4.2 Conclusion

The results of the study showed that bacteria and fungi are present on the meat seller table. Two different fungi species were isolated from the sample, three of the fungi were Aspergillus species: (*Aspergilusniger, Aspergilus flavus, Aspergillus fumigatus*) and *Oidiodendron griseum*. Six different bacteria specie were isolated from the sample, three-gram negative which are: *Escherichia coli, Klebsiella pneumonia, Bacillus subtilis, Salmonella specie*, and the antibiotic are five, four and two respectively that are susceptible to the antibiotic and three from gram positive which are*: Bacillus subtilis, Streptococcus species*and *Staphylococcus aureus*, and the antibiotic are five, two and three respectively that are susceptible to the antibiotic.

4.3 Recommendations

Government should create awareness to the public on the dangers of foodborne illness.

Proper washing and cooking of the meat should be encouraged.

Meat sellers should ensure standard hygiene practices and ethics in the selling of their meat product.

Further research is encouraged to be conducted to discover more microbial contaminates on the meat seller tables

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Comment [H13]: Writing a bibliography is adjusted to the writing guidelines in the journal, you can use the Mendeley or Zotero applications. References that are too old should be replaced with newer ones

Comment [H14]:

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