ASSESSMENT OF BACTERIAL LOAD OF BEEF VISCERAL IN IBADAN NORTH LOCAL GORVERNMENT AREA OF OYO STATE

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ABSTRACT

The study was carried out to identify the bacteria counts and percentage occurrence of fresh beef visceral organ collected from four major markets in Ibadan North Local Government. Sixteen strains of bacteria were isolated and identified based on metabolic and physiological features. Results showed that, total bacterial counts of beef visceral in all the markets were highest in the liver ($3.24x10^5$), followed by the lungs ($2.48x10^5$), and lowest ($1.22x10^{5)}$ in the heart. Among the markets, total bacterial counts in beef visceral samples were highest ($3.01x10^{5)}$ at Bodija market and lowest ($1.97x10^5$) in Agbowo market. The bacterial isolated showed that *Escherichia coli* had the highest percentage occurrence of 13.64%, followed by *Aerobacter aerogenes* (10.61%), and least (0.05%) of *Micrococcus viridians*. Zoonotic bacterial was not implicated in any of the organs. Hence, presence of these organisms is an indication of contaminants due to unhygienic meat processing and handling methods.

Keywords: Beef visceral, bacterial counts, public health hazard.

INTRODUCTION

In south western Nigeria, cattle remain the major provider of meat (beef) and its product (liver, lungs, kidney, heart etc.) for most households. This is due to its large size and the components, which are capable of providing proteins, energy, minerals and vitamins to a larger population of consumer. The edible parts of carcasses include the flesh and visceral organs or offals, such as the heart, liver, kidney, lungs, tongue, oesophagus and the brain. As a result of the increasing demand for animal protein by humans, slaughtering of all kinds of livestock continue to increase daily to meet the increasing demand of meat. Although, meat is considered as a concentrated nutrient source essential to optimal human growth and development (Higgs, 2000), however, it is also considered as the most perishable of all important food consumed by humans. The nutrient contents, coupled with the high water content corresponding to the water of activity (approximately 0.99) makes it suitable for microbial growth (Rao *et al.*, 2009). Despite the increase in demand for beef and its products in Nigeria, food safety standard is being compromised. Zare *et al.* (2014) reported that many of the illnesses and death of humans has been attributed to foodborne diseases associated with pathogenic bacterial and fungal species. Fasanmi *et al.* (2010) also reported that poor hygiene and sanitary practices along the food production chain contribute to unacceptable level of microbial load in meat, which poses serious health risks to consumers The source of pathogenic microorganism may be from the animals themselves, surroundings where the animals are kept or from the ways of handling during processing after slaughtering (Adeyemo, 2002). Therefore, detection of zoonotic conditions through post mortem inspection is germane in order to reduce public health risks. Visceral organs or offals (tongue, heart, liver, kidneys, lungs diaphragm, oesophagus, intestines and brains) are preference parts of carcasses that are in high demand by consumers due to its greatest dietetic value with reference to certain nutrients. Visceral organs have been implicated in harbouring highest load of pathogenic micro-organisms (FDA, 2007). The rich nutrient contents in visceral organs provides suitable medium of growth for harmful micro-organism (Magnus, 1981). Limited studies have been conducted to assess microbial contamination of beef visceral organs from the abattoirs to retail meat outlets. This study was conducted to isolate, and identify bacteria counts in beef

kidney liver, heart and lungs from four different markets in Ibadan North Local Government of Oyo State, Nigeria.

MATERIALS AND METHODS

Study site and sample collection

This study was carried out in four (4) selected markets namely, Bodija, Sango, Ojoo and Agbowo, located in Ibadan North Local Government Area, Oyo State. Fresh organ (liver, lungs, heart and kidney) samples were collected from four (4) meat stalls in each market, and put into sterile sample bottles, and taken to the laboratory for microbiological analysis within 6 hours of collection.

Microbiological analysis and bacterial counts

Microbial analyses were carried out as described (FAO, 2007) and Olutiola *et al.* (1991). . Serial dilution method was used for total bacterial counts. Bacteria colonies were counted using the plate count agar on all the media used, and results were recorded. Total aerobic and bacterial counts were expressed as colony-forming units per gram of sample (cfu/g)

Identification of Microbes

Pure isolates of bacterial growth were identified using morphological and biochemical methods as described (Lennette *et al.*, 1985; Jolt *et al.*, 1994). The numbers of occurrence of each identified bacterium were recorded with its percentage occurrence. The sterility of each batch of test medium was confirmed by incubating one or two non-inoculated tubes or plates along with the inoculated tests. The non-inoculated tubes or plates were always examined to show no evidence of bacterial growth.

Statistical Analysis

Data obtained for bacterial counts were subjected to statistical analyses using SPSS (Social Package for the Social Sciences), and values were presented as mean values along with their standard error of means, and Student's t test were used to determine significant differences ($P< 0.05$) among the bacterial.

RESULTS AND DISCUSSION

The mean counts of bacterium isolated from the visceral samples from the four markets were significantly ($P<0.05$) different (Table 1).The mean values ranged from 0.10±0.000 (Log_{10}cfu/g) to 0.96±0.005 (Log_{10}cfu/g), with the highest counts in the liver (0.96±0.005), and the least counts in the heart (0.10±0.000) at Bodija and Sango market, respectively. Total bacterial counts of beef visceral in all the markets were highest in the liver ($3.24x10^5$), followed by the lungs ($2.48x10^5$), and lowest ($1.22x10^{5)}$ in the heart. Among the markets, total bacterial counts in beef visceral were highest ($3.01x10^{5)}$ at Bodija market and lowest ($1.97x10^5$) in Agbowo market. The range ($1.97x10^5$-$3.01x10^5$cfu/g) of total bacterial counts in this study exceed the FAO/WHO limit of 1.0x10cfu/ml for food and water, an indication that, visceral organs harbour the highest load of pathogenic micro-organisms (FDA, 2007). Although, contamination could be a contributing factor due to exposure of the surface area to water, nutrients and greater oxygen penetration (Forest *et al.*, 1985). Table 2 shows the bacterium isolated from beef visceral samples and their percentage occurrence. *Escherichia coli* had the highest percentage occurrence of 13.64%, which is in line Fasanmi *et al.*, (2010) that *E. coli* is a major meat contaminant, followed by *Aerobacter aerogenes* (10.61%), and least (0.05%) percentage occurrence of *Micrococcus viridians*. The identified bacterial (Gram positive and Gram negative) corroborated the findings of Clarence *et al.* (2009) that Gram negative bacteria account for approximately 69% of the cases of bacterial food-borne diseases. The presence of these organisms in all the samples is indicative of contaminants due to unhygienic meat processing and handling (Barros *et al.*, 2007) methods, which are possible causes of food borne intoxication and infection. However, findings from this study did not reveal the presence of zoonotic bacteria such as *Brucella* and *Listeria* in beef visceral samples.

CONCLUSION

Beef visceral (Heart, kidney, liver and lungs) organ from the study areas had higher bacterial counts above FAO/WHO limit of 1.0x10cfu/ml for food. While the absence of zoonotic bacteria in the samples revealed that the bacteria load are attributed to unhygienic practices at various abattoirs and meat markets in Ibadan. Hence, the need to educate butchers and meat sellers on health and hygiene practices, and enforcement of Veterinary legislation.

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Table 1: Mean values of Bacterial Counts in beef organs

	Bacterial Counts (Log $_{10}$ cfu/g)					
Markets	Heart	Kidney	Liver	Lungs	Total	P-value
Bodija	0.59±0.005	0.67±0.005	0.96±0.005	0.79±0.017	$3.01x10^5$	< .0001
Sango	0.10±0.000	0.51±0.012	0.77±0.017	0.63±0.017	$2.01x10^5$	< .0001
Ojoo	0.22±0.017	0.49±0.017	0.82±0.017	0.57±0.012	$2.10x10^5$	< .0001
Agbowo	0.31±0.005	0.48±0.011	0.69±0.011	0.49±0.017	$1.97x10^5$	< .0001
Total	$1.22x10^5$	$2.15x10^5$	$3.24x10^5$	$2.48x10^5$	$9.09x10^5$	

Table 2: Bacteria isolated and their percentage occurrence

Bacteria	**Number of isolates**	**Percentage occurrence**
Aerobacter aerogenes	21	10.61
Bacillus aureus	14	7.07
Bacillus substilis	9	4.55
Escherichia coli	27	13.64
Klebsiela aerogenes	18	9.09
Micrococcus acideophilus	12	6.06
Micrococcus luteus	13	6.57
Micrococcus viridians	1	0.05
Proteus vulgaris	11	5.56
Pseudomonas aeruginosa	11	5.56
Pseudomonas nigrifiscence	7	3.54
Salmonella enteritidis	14	7.07
Salmonella typhimurium	12	6.06
Streptococcus aureus	7	3.54
Streptococcus faecalis	13	6.57
Streptococcus pyogenic	8	4.04
Total	**198**	