

Full Length Research Paper

# Comparative study of bacteriological analysis in hawked suya meat and suya meat on a Barbeque stand

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Suya meat is a traditional meat that is commonly produced from beef although chicken can also be used. Suya meat were bought from two different vendors (hawker and the one on a barbeque stand) in two different location in Ozoro Delta State and was coded as A (suya meat on barbeque stand) and B (Hawked suya meat). Five bacterial species were isolated, in which three species were isolated from suya meat on Barbeque stand; *Bacillus subtilis*, *Enterobacter aerogenes* and *Escherichia coli*, while five species were isolated from hawked suya meat; *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Enterobacter aerogenes* and *Lactobacter species*. The total heterotrophic plate count for both samples ranges from  $4.0 \times 10^4$  –  $6.0 \times 10^4$  CFU/ML. Among samples, *Enterobacter aerogenes* and *Bacillus subtilis* (30%) has the highest percentage occurrence while *Staphylococcus aureus* and *Lactobacter species* (10%) have the least percentage occurrence in the samples. Judging by the result therefore, It is obvious that commercial suya product sold by hawkers are more contaminated with pathogenic bacteria than suya meat sold on barbeque stand and calls for connected efforts on the part of relevant authorities to check the trend since it is a public health concern.

**Keywords:** Suya meat, Barbeque stand, hawk, bacteriological, quality.

## INTRODUCTION

Generally, 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 (May *et al.*, 2003), accounting to a great extent why it is perishable. In the world today, traditionally processed meat products are consumed in different countries, amongst which is the meat delicacy called “suya” (Vilar *et al.*, 2000). “suya” is a traditional meat product gotten from boneless meat hung on stick and spiced with peanut cake, salt, vegetable oil and other flavours followed by toasting around a glowing charcoal fire. It has become very popular as a street delicacy in several countries, particularly those in West Africa. (Inyang *et al.*, 2005).

The high ultimate pH of meat generally makes it very susceptible to microbial growth even under the best

handling or manufacturing conditions and practices (Itedrick *et al.*, 1994). Sequel to the developments, some researches elsewhere had noticed sporadic cases of gastroenteritis and symptoms of infection after consumption of “suya” which indicated that the product indeed constitute a food safety risk (Odusole and Akinyanju, 2003; Inyang *et al.*, 2005). Literature has it that microorganism isolated from “suya” are of public health significance, as study conducted on “suya” (dried smoked meat) sold in Undo and Akure South West Nigeria revealed bacterial, molds, yeast and fungi (Egbebi and Seidu 2011). Inyang *et al.*, (2005) also evaluated the bacterial quality of suya sold in Markurdi, Northern Nigeria and concluded that faecal coliforms were the main bacterial contaminants although they occurred within acceptable limit.

Meanwhile Edema *et al.*, (2008), who evaluated the microbial hazards associated with processing of suya meat, reported that processing water, meat processing slabs, utensils, spices and raw material revealed contamination with potential pathogens such as *Bacillus*

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*Cereus*, *Staphylococcus aureus*, *Salmonella species* and aflatoxigenic molds with aerobic mesophilic counts in the order of  $10^5$  cfu with the highest value (7.17) observed in the packaging materials and then lowest value (1.47) observed in the processing water. It is imperative to note that the tremendous growth in the production and consumption of "suya" in the South-South zone of Nigeria has made it a great concern to study and to know its microbial quality.

This study therefore examines to isolate, characterize, and identify the occurrence of bacteria on hawked suya meat and suya meat on barbeque stand thereby ensuring the safety of the population at risk in eating contaminated suya meat and also to determine the bacterial status of "suya" sold in Ozoro, Delta State, Nigeria.

## METHODOLOGY

### Study area

The study area was Ozoro, the local government headquarter of Isoko North local government area of Delta State, South-south region of Nigeria.

### PREPARATION OF MEDIA

38g of the commercial nutrient agar powder was weighed and dissolved in 1 liter of distilled water in conical flask and then, autoclave at 15bs pressure at a temperature of  $121^\circ\text{C}$  for 15 minutes. After sterilization the prepared media was aseptically poured into sterile Petri dishes (plates) and allowed to solidify, dries at  $37^\circ\text{C}$  in the oven and stored at  $4^\circ\text{C}$  for use when required.

### METHOD USED

#### Sample collection and analysis

Suya meat samples were bought from two different suya meat vendors (hawker and the one on a barbeque stand). The samples were labeled A and B. Both were transported to the laboratory where analysis was carried out on them. Samples of the suya meat were mashed in a sterile laboratory type mortar and pestle into a paster.

Sample A: Suya meat on Barbeque stand.

Sample B: Hawked suya meat.

The samples were homogenized 90ml of distilled water in a beaker differently. This was centrifuge and the supernatant was collected and diluted in a tenfold serial dilution using normal saline as diluent, 10mls of

homogenization was mixed with 90ml of the dilution prepared until a tenth tube which gave a final dilution of  $10^{-10}$  inoculation was done using the ninth of  $10^{\text{th}}$  dilution ( $10^{-9} \times 10^{-10}$ ). This prevented the likelihood of overcrowding the plate with micro organisms. Plating was done on the following prepared media, nutrient agar and was incubated  $250^\circ\text{C}$  -  $550^\circ\text{C}$  for 24 hours. Colonies that appeared at the end of the incubation period were used for the isolation and identification of bacteria. Usually discrete colonies from clear plate were picked and gram stained smear were examined under oil immersions objective dropped at the microscope following the staining reaction and observed morphological features, these colonies were streak into fresh medium to obtain a pure culture isolate were subjected to confirmation tests. Growth of organisms was identified according to their morphological characteristics and reactions to biochemical test.

## RESULT AND DISCUSSION

Environmental health and personal health status of the place that hawked suya meat and suya has been processed. Samples of suya meat on barbeque stand were obtained from a suya spot situated at a serene environment in front of a classic hotel in Ozoro. It's far from the drainage system, and other environmental pollutants. It has a neat slab for preparation.

Hawkers on the other hand are those vendors that move from one place to another in order to sell their products. The route where the suya meat was obtained from the hawker was not hygienic, they move from location to location irrespective of the hygienic nature of the environment. The processed suya meat on the hawkers stand was not well covered and contains few dust particles.

The bacterial isolated from the suya meat sample were *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Enterobacter aerogenes*, *Lactobacter species*. Some bacterial isolates have shown the ability to utilize sugar as their substrate which was shown in table 1. Table 2 shows the total heterotrophic plate count range of isolates from suya meat samples. Table 3 shows the isolates and its' total heterotrophic plate count from the suya meat sample. Table 4 shows bacterial isolates, number of occurrence and percentage of occurrence

### Discussion

The observed viable microbial count in suya samples analysed were in line with reports by Inyang *et al.*, (2005) and Egbebi and Seidu, (2011) that suya processed and sold have microbial contaminants.

Similarly, our findings are in line with the reports by Edema *et al.*, (2008) and Ologho *et al.*, (2010) on the

**Table 1:** Shows cultural, morphological and biochemical characteristics of bacteria isolates.

ISOLATE	GRAM STAIN	morphological characteristics	CITRATE	CATALASE	INDOLE	GLUCOSE	LACTOSE	H <sub>2</sub> S	GAS
<i>Staphylococcus aureus</i>	GPC	Cocci	-	+	+	+	+	-	+
<i>Bacillus subtilis</i>	GPB	Rods	-	+	-	+	+	-	-
<i>Escherichia coli</i>	GNB	Rods	-	+	+	+	+	-	+
<i>Enterobacter aerogenes</i>	GPB	Rods	+	+	-	+	+	-	-
<i>Lactobacter species</i>	GPB	Rods	-	+	-	+	+	+	-

Key = + = positive, - = negative, GPB = Gram positive Bacillus, Gnb = Gram negative Bacillus, Gpc = Gram positive Cocci

**Table 2:** Total heterotrophic plate count range of isolates from suya meat samples

Sample	Cfu/g
A	4.0 x 10 <sup>4</sup> -6.0x10 <sup>4</sup>
B	4.0 x 10 <sup>4</sup> -6.0 x 10 <sup>4</sup>

**Table 3:** Bacteria Isolates and it's total Heterotrophic plate count from the suya meat sample

Sample	Bacterial	Cfu/ml	Dilution 10 <sup>3</sup> Cfu/ml
A	<i>Bacillus subtilis</i>	60	6.0 x 10 <sup>4</sup>
	<i>Enterobacter aerogenes</i>	40	4.0 x 10 <sup>4</sup>
	<i>Escherichia coli</i>	40	4.0 x 10 <sup>4</sup>
B	<i>Escherichia coli</i>	48	4.8 x 10 <sup>4</sup>
	<i>Staphylococcus aureus</i>	60	6.0 x 10 <sup>4</sup>
	<i>Bacillus subtilis</i>	40	4.0 x 10 <sup>4</sup>
	" "	52	5.2 X 10 <sup>4</sup>
	<i>Enterobacter aerogenes</i>	48	4.8 x 10 <sup>4</sup>
	<i>Lactobacter species.</i>	40	4.0 x 10 <sup>4</sup>

**Table 4:** Shows bacterial isolates, number of occurrence and percentage of occurrence

Bacterial isolates	Number of occurrence	Percentage (%) of occurrence
<i>Bacillus subtilis</i>	3	30
<i>Enterobacter aerogenes</i>	3	30
<i>Escherichia coli</i>	2	20
<i>Staphylococcus aureus</i>	1	10
<i>Lactobacter species</i>	1	10

microbial hazards of poorly processed suya. This is attributed to personal hygiene amongst the sellers of suya since humans are the largest source of food contaminants (Marriot, 1985). Although the viable microbial count recorded in this study was relatively low, it remains however a cause for concern considering the established limits in the Public Health Laboratory Service guidelines for bacteriological quality of ready-to-eat food samples at the point of sale (PHLS, 2000). On the other hand, the incidence of *Staphylococcus spp.* observed in

this study is commonly found in hands, skin and clothing. In fact, most of those involved in the processing and sale of suya are usually illiterates without formal training on food preparation which is necessary in the hygienic handling of foods. (FAO, 1999). Furthermore, our result agrees with the findings by Shamsudden and Ameh, (2008) who reported on high incidence of coagulase positive, *Staphylococci* and *Echerichia coli* in Kilishi (a type of suya product) from Kano metropolis. Recall that *Enterobacter aerogenes* and *Bacillus subtilis* were

isolated from all the suya samples examined and the presence of *Bacillus spp* in them rendered the samples unsatisfactory According to PHLS, (2000). Specifically, the Health Laboratory Service Guidelines (HLSG) for bacteriological quality or ready-to-eat foods at the point of sales stipulates that a food is unacceptable if the level of *Staphylococcus aureus* is about 10<sup>3</sup> cfu/g (PHLS, 2000). Also the level of the organisms in food has been described as an index of food hygiene (Jay, 1978).

Generally, these contaminating organisms might have originated from the handlers hand, the utensils, air and even from the ingredients like the spices, because according to Frazier and Westhoff , (2006), spices may even serve as a source for the contamination of processed food products.

## CONCLUSION

Judging by the results therefore, it is obvious that commercial suya products sold are potentially contaminated and calls for concerted efforts on the part of relevant authorities to check the trend, since it is a public health challenge

## RECOMMENDATIONS

1. The public health laboratory service should take it as a pain to educate suya sellers on food preparation.
2. Suya sellers should try and make the environment for the preparation clean and good to avoid bacterial.
3. The utensils used for the preparation should be kept clean always since microorganisms may develop in them if poorly handed.
4. Consumers should minimize their level of consumption so as to avoid the buildup of bacterial in the body system.

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