Microbial Assessment of Chicken and Beef Suya Samples in Oyo, Nigeria

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Abstract: Ready to eat chicken and beef samples were collected from suya processors in different locations within Oyo town. Studies on the microbiological quality of chicken and beef suya were carried out. The total viable count ranged from 7.00 x 10^5 to 15.00 x 10^5 cfu/g for the chicken and beef suya samples. The yeast and mould count ranged from 1.00 x 10^5 to 7.00 x 10^5 cfu/g while the total Coliform count ranged from 1.00 x 10^5 to 5.00 x 10^5 cfu/g for all the samples. The moisture contents of the chicken and beef suya samples 1.56 to 2.06 % for all the samples while the pH of the two samples was also between 6.80 and 7.10. The bacteria that were isolated from the chicken and beef suya samples were; *Bacillus* sp., *Escherichia* sp., *Pseudomonas* sp. and *Staphylococcus* sp. while the fungi isolates were *Aspergillus* sp. and *Penicillium* sp. The isolation of probable potential pathogens from suya samples analyzed is of public health significance. Aseptic techniques should be adequately employed in the meat industries in order to reduce microbial load of meat and meat products for safe consumption by consumers and thus prevent food-borne diseases and infections.

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1. Introduction

The chicken (*Gallus gallus domesticus*) is a domesticated fowl, a subspecies of the Red jungle fowl. As one of the most common and widespread domestic animals, and with a population of more than 24 billion in 2003 (Garrigus, 2007), there are more chickens in the world than any other species of bird. Humans keep chickens primarily as a source of food, consuming both their meat and their eggs. Cattle are the most common type of large domesticated ungulates. They are prominent modern member of the subfamily Bovinae, are the most widespread species of the genus Bos, and are most commonly classified collectively as Bos primigenius. Cattle are raised as livestock for meat (beef and veal), as dairy animals for milk and other dairy products, and as draft animals (oxen or bullocks), pulling carts, plows and the like (Brown, 2009). Meat is the flesh of animals which serves as food; it could be obtained from sheep, cattle, goat, swine or poultry (Haman, 1997). Chicken and beef suya are common delicacies to many Nigerians.

Chicken and beef suya vendors are found in almost every neighborhood with a dense population for various daily formal or informal economic activities. Suya is a street processed, roasted and vended meat product (SON, 1996). Suya (Hausa language for roasted meat) is a popular spicy, smoked or roasted street meat in Nigeria and other countries surrounding Northern Nigeria like Chad, Sudan and Niger (Inyang *et al.,* 2005). It is served or sold in public places along the streets in club houses, restaurants, picnics and even in hotels. Owing to the spoilage potential of meat, many varieties of preservation techniques are employed in improving its keeping quality and shelf life. Suya is prepared basically from boneless meat of animals (Abdullahi *et al.,* 2004).

Muscles meat of almost any kind can be dried to increase its keeping quality. In Nigeria, the majority of meat produced in abattoirs is sold for immediate consumption through retailers who buy from butchers and resell to consumers who usually subject it to cooking and consume within days. However, for various reasons, there are leftovers that are not sold. Since proper storage facilities are lacking, the leftover meat is processed into various forms in order to avoid spoilage. This involves improvising traditional techniques of preservation. As an alternative, meat is preserved by processing to semi-dry and dry forms. One of the products that the meat is processed into is suya. Suya products can become contaminated microbiologically from raw materials, handlers, equipments or utensils etc. Therefore, this work aimed at determining the microbial quality of chicken and beef suya in some locations in Oyo town, Nigeria.

2. Materials and Methods

Sample Collection

Samples of chicken and beef suya used in this study were obtained from some suya spots at different locations in Oyo town. The suya samples were purchased and transported to the laboratory using

clean aluminum foil. The samples were analyzed within 24 hours of collection.

Microbiological Analyses

Treatment of Samples

A piece (1g) from each sample was removed carefully, kept in a sterile stomacher bag. 10ml of sterile distilled water was added and this was blended in the stomacher.

Isolation of Microorganisms

Test tubes containing 9mls each of sterile distilled water were labeled with different dilutions. 1ml of the blended meat was weighed and then aseptically introduced into 9ml of sterile distilled water to give dilution 10^{-1}, this was then properly shaken. This method of transferring was done until dilution 10^{-10} was obtained. The media used were Nutrient agar (NA) , Potato Dextrose Agar (PDA) and MacConkey agar (MA) . Baird Parker Medium (BPM) was used for the isolation of *Staphylococcus aureus*. Pure culture was obtained by repeated streaking into freshly prepared agar plates (Buchanan and Gibbon, 1974).

Identification of Bacteria

The bacterial isolates were characterized and identified using Bergey's Manual of Systematic Bacteriology (Buchanan and Gibbons, 1974).

Identification of Fungi

A drop of lactophenol was placed on a clean glass slide. The organism was picked with the inoculating needle after flaming and teased carefully and was covered with cover slip. The slide was viewed under the light microscope and they were observed based on their mycelium, septate or non-septate hyphae and characteristics of sexual reproductive structures.

Physico-Chemical Analyses

Determination of pH

The pH of the beef and chicken suya samples was determined using a pH meter (model number H198107) that was previously calibrated. 1g of the sample was taken, blended and mixed with 10ml of sterile distilled water. It was thoroughly mixed and then measured with the pH meter.

Determination of Moisture Content

The moisture content of the samples was determined using the method of A.O.A.C (1999). An empty crucible with the lid was dried in an oven at 105^{o}C for 3 hours and was transferred to a desiccator to cool. This was weighed accurately; 3g of the sample was then weighed into the crucible and was spread uniformly. The crucible and the sample were dried in an oven at 105^{o}C 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 reweighed.

3. Results

The chicken and beef suya samples were analysed for their microbial and physico-chemical profile. The organisms isolated from the samples were; *Staphylococcus* sp, *Escherichia coli, Bacillus* sp, *Pseudomonas* sp, *Aspergillus* sp and *Penicillium* sp.

The total viable count chicken suya samples and the beef suya samples obtained on PDA ranged from 1.00 to 7.00 cfu/g x 10^5 while on nutrient agar it ranged from 7.00 to 15.00 cfu/g x 10^5 while the microbial count on MacConkey agar ranged from 1.00 to 5.00 cfu/g x 10^5 (Table 1).

The frequency and percentage occurrence of the bacterial isolates shows that *Bacillus* sp had the highest occurrence (45%) while *Pseudomonas* had the least (15%) (Table 2). The frequency and percentage of occurrence of the fungal isolates shows that *Aspergillus* sp had the highest percentage occurrence (66.7%) while *Penicillium* sp had the least (33.3%) as shown in (Table 3).

The pH of the chicken and beef suya samples obtained for all the samples ranged from 6.80 to 7.10 while the moisture content ranged from 1.56 to 2.06% for all the suya samples while BS_1 had the highest moisture content of 2.06% while CS_1 and BS_2 had the least moisture content with value of 1.56% (Table 4).

4. Discussion

In this study, the microorganisms isolated were *Staphylococcus* sp, *Escherichia coli*, *Bacillus* sp, *Pseudomonas* sp, *Aspergillus* sp and *Penicillium* sp. The result was in accordance with the report of Chukwura and Majekwu (2002) which stated that microbiological analysis of meat samples in Awka urban of Anambra State, indicated contamination of meat samples with various bacterial species including *Staphylococcus aureus* and some enteric bacteria. Gilbert and Harrison (2001), also affirmed that meat preserved with a certain amount of salt by permit the growth of *Staphylococcus aureus* whereas the presence of some members of the family of Enterobacteriacea family is due to contamination from intestine of slaughtered animals. The presence of *Staphylococcus* species also agrees with the report of cross contamination from meat handlers during processing, since it is normal floral of the skin (Gilbert and Harrison, 2001).

Table 1. Microbial count of the chicken and beef suya samples (cfu/g) x 10^5

Samples	Yeast and Mould Count	TVC Count	Total Coliform Count
CS_1	*3.00	9.00	2.00
CS_2	1.00	8.00	1.00
CS_3	6.00	10.00	2.00
CS_4	5.00	8.00	3.00
CS_5	3.00	7.00	1.00
BS_1	7.00	7.00	4.00
BS_2	4.00	8.00	2.00
BS_3	5.00	10.00	3.00
BS_4	6.00	15.00	5.00
BS_5	7.00	12.00	1.00

*Data are means of three replicates

Key:
CS = Chicken Sample
BS = Beef Sample
TVC = Total Viable Count

Table 2. Frequency of occurrence of Bacterial isolates from the chicken and beef suya *samples*

Isolates	Frequency	Percentage of Occurrence (%)
Bacillus sp	09	45
Staphylococcus sp	04	20
Escherichia coli	04	20
Pseudomonas sp	03	15
Total	20	100

Table 3. Frequency of occurrence of Fungal isolates from the chicken and beef suya samples

Isolates	Frequency	Percentage of Occurrence (%)
Aspergillus sp	04	66.7
Penicillium sp	02	33.3
Total	06	100

Table 4. Physico-chemical analyses of the chicken and beef suya samples

Samples	Moisture Content (%)	pH
CS_1	*1.56	7.00
CS_2	1.62	7.00
CS_3	2.01	7.10
CS_4	2.03	7.00
CS_5	1.60	7.00
BS_1	2.06	6.80
BS_2	1.56	6.90
BS_3	1.58	7.00
BS_4	2.00	7.10
BS_5	2.05	7.00

***Data are means of three replicates**

Key:
CS = Chicken Samples
BS = Beef Samples

5. Conclusion

In conclusion, the microorganisms isolated from the chicken and beef suya samples indicated that the standards of preparation and preservation have not improved over the years and facilities used in the preparation are not sterile. Aseptic techniques should be adequately employed in the meat industries in order to reduce microbial load of meat and meat products

for safe consumption by consumers and thus prevent food-borne diseases and infections.

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References

1. AOAC. Official Method of Analyses of the Association of Official Analytical Chemists 16th Edition. AOAC International Gaithersburg MD. USA. 1999.
2. Abdullahi IO, Umoh VJ, Ameh, JB, Galadima M. (2004) Nigerian Journal of Microbiology 2004. 18(1 – 2), pp. 339 -345.
3. Abdullahi IO, Umoh VJ, Galadima M. Hazards associated with Kilishi preparation in Zaria, Nigeria, Nigerian Journal of Microbiology 2004; 18(1 – 2), 338 – 345.
4. Brown D. "Scientists Unravel Genome of the Cow". The Washington Post. 2009.
5. Buchanan RE, Gibbons NE. Bergey's Manual of Determinative Bacteriology. 8th Edition: The Williams and Wilkins Company, Baltimore, 1974.pp. 539.
6. Chukwura EI, Majewu CN. Prevalence of Microbial Contaminants of Suya meat sold in Akwa Urban, Journal of Tropical Microbiology *2002*; 11, 89 – 91.
7. Edema MO, Osho AT, Diala CT. Evaluation of Microbial Hazard associated with Processing of Suya (a grilled meat product), Scientific Research and Essay, 2008;3(12), 621 – 626.
8. Field RA. Enteric and Food-borne illness, Advanced Food Research, 2002;*27*, 28 – 35.
9. Garrigus WP. "Poultry Farming" Encyclopedia Britannica. 2007.
10. Gilbert U, Harrison A. Occurrence of enterotoxin-producing *Staphylococcus aureus* in meat market in Nigeria, Journal of Food Infection, 2001*;* 56, 25 – 35.
11. Haman DO. Microbiology of Meat and Food Technology 1997; 23(6), 66 – 71.
12. Inyang CU, Inyor MA, Uma EN. Bacteriological quality of a smoked meat product (suya), Nigerian Food Journal 2005; 23, 239 – 242.
13. Prescott LM, Harley JP, Klein DA. Microbiology (*5th* Edition) McGrawHill. London. 2002; pp 963 – 971.
14. Shamsudeen U, Oyeyi TI. International Journal of Pure and Applied Science 2008; *2*(3), 6 – 10.
15. SON (Standards Organization of Nigeria) Standards Organization of Nigeria and Consumer Protection. Paper delivered at a Workshop on Street Food organized by Nigerian Institute of Science and Technology, University of Agriculture, Umudike, Nigeria.1996;5 – 6.

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