Research Article

Bacteriological analysis of suya meat sold in nkwo market of okija and the associated health implications

Abstract

This research work was done to ascertain the bacterial load of Suya sold in Nkwo market of Okija town in Ihiala LGA of Anambra State. It was also done to reveal the health implication of the suya. Three samples of Suya were randomly collected from suya sellers within the market. The samples were analyzed microbiologically using spread plate technique. The bacterial isolates were identified. The isolates were identified as Staphylococcus spp., Escherichia coli and Klebsiella spp. The total bacterial count for the isolates were 2.5×10^3, 4.3×10^4 and 5.4×10^3 respectively. For the coliform count, 0.5×10^3, 3.0×10^3 and 1.2×10^3 were identified. The presence of Staphylococcus is associated with cross contamination from meat handlers during processing, the presence of Escherichia coli is probably due to use of contaminated water during washing of raw meat while Klebsiella spp. is most likely transmitted from the hands of meat workers. This calls for improved production hygiene and public health awareness. Education and awareness campaign should be organized for the Suya seller on the proper hygienic practices to adopt during suya processing.

Keywords: colony, isolation, dilution, incubation, agar, contamination, coliform

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Introduction

Suya is a special meat from beef. It is never boiled before post processing. It is a popular spicy, smoked, or roasted street meat in Nigeria and other countries surrounding northern Nigeria like Chad, Sudan and Niger.[1] Suya production and consumption is about the main nutrition source. Similarly, it has also been reported as ideal for the growth of a wide range of spoilage bacteria,[2] accounting to a great extent because it is perishable. In the world today, traditionally processed meat products are consumed in different countries, amongst which is the meat delicacy called "suya".[3] The high ultimate pH of meat generally makes it very susceptible to microbial growth even under the best handling or manufacturing conditions and practices. 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 research involves the examination of some suya meat in order to isolate and identify the bacterial content of some samples of suya meat sold in Nkwo Market in Okija. This market is strategic as it is the only market close to Legacy and Madonna University. Students go to this market often to buy their things including suya meat.

The consumption of suya has extended to other parts of the country.[4] In Nigeria, suya sales in cities and small towns are prominent. Suya is prepared basically from boneless meat of animals. Though suya is spicy and juicy to look at. The processing arena is discouraging and a sorry sight. In suya preparation, use of lean meat is necessary since fat becomes rancid during the drying process.[5] While suya is cherished for its distinct flavor and cultural significance, concerns have emerged about its safety and impact on human health, particularly in terms of bacteriological contamination. The preparation process carried out under largely unhygienic conditions and the risk of contamination is very high. The objective of this research work is to access and analyse suya meat sold in Nkwo market of Okija town of Ihiala LGA with the view of ascertaining its bacterial content and health risk associated with it.

Study area

The study area is Ihiala local Government area of Anambra state, the population for this study were selected suya meat hawkers in Okija, Anambra State, Nigeria. Anambra state is a state located in South-Eastern Nigeria and it is one of the largest state of the Nigeria federation. Anambra State covers an area of 4,816.2 square kilometres

Sample collection

Suya meat samples were bought from three different suya meat vendors/sellers popularly called Aboki. The ten samples were wrapped in their usual paper and put in a sterile nylon bag. They were taken to the microbiology laboratory of Legacy University Okija for analysis the samples were labeled A, B and C. The samples were transported to the laboratory where analysis was carried out on them.

Sample processing

One (1) gram of each sample was taken and put into three different sterilized mortars and pestle was used to crush them. The crushed samples were aseptically transferred to three different 10 ml of sterile distilled water in test tubes to form stock culture.

Serial dilution

The serial dilution method as described by[6] was adopted. This was done up to six diluents.

Inoculation of samples

Spread plate technique was adopted. Nutrient agar plates were used for enumeration of total bacterial count while MacConkey agar plates were used for enumeration of coliform count. The plates were inoculated in duplicates. They were incubated for 24 hrs at 37^0C.[7]

Bacterial plate count

After the incubation of different plates, the different colonies formed on the media were counted using the digital colony counter.

The total population of the colonies was expressed as colony forming unit per Gram (CFU/g).

Biochemical test

The following biochemical test were done and the results documented.

- Gram staining
- Biochemical test
- Citrate Test
- Oxidase test
- Catalase test
- Indole test
- Triple Sugar Iron Agar Test
- Coagulase test
- Methyl Red (MR) Test
- Voges-Proskauer test

Results

From the incubated plates and analysis done, three bacterial pecies were isolated which include *Staphylococcus spp*, *Klebsiella* and *Escherichia coli* (Tables 1, 2, 3).

Table 1 Total bacterial count of the three samples

Sample	Total Bacterial Count (cfu/g)
A	2.5×10^3
B	4.3×10^4
C	5.4×10^3

Table 2 Total coliform count of the three samples

Sample	Coliform Count (cfu/g)
A	0.5×10^3
B	3.0×10^4
C	1.4×10^3

Table 3 Biochemical Characteristics of the three isolates

CA	OX	CO	CI	IN	VP	MO	MRT		Organisms
+	–	+	–	-	+		–	–	*Staphylococcus spp.*
+	–	+	–	+		+	+	–	+	*E. coli*
+	–	+	+	–	+	–	–	–	+	*Klebsiella spp.*

MO, motility; CI, citrate; UR, urease; IN, indole; CA, catalase; CO, coagulase; OX, oxidase; VP, Voges Proskauer; MRT, methyl red test; TSI, triple iron sugar.

Discussion

In this research study, the three isolates are *Staphylococcus* species, *Escherichia coli and klebsiella* species. All the bacteria species reported in this study were previously isolated and reported by other researchers. For instance,[8] isolated *Bacillus spp.* and *Staphylococcus aureus* from suya meat samples collected from different suya spots in Akwa Ibom. Also isolated *Pseudomonas spp., Bacillus cereus* and *Staphylococcu aureus* from tsire-suya, a Nigerian meat product.[9] isolated *Bacillus spp.* And *Staphylococcus aureus* from a popular roasted meat (tsire) in Zaria, Nigeria. Also isolated species of *Staphylococcus, Streptococcus, Escherichia coli* and *Bacillus spp.,* from the suya samples from Nsukka, Enugu state, Nigeria. Isolated *Escherichia coli*, *Staphylococcus aureus, Klebsiella spp., Bacillus spp.* And *Pseudomonas spp.* rom suya sold in Makurdi, Benue state, Nigeria have been reported.[9] Similarly, the findings are in line with the reports on the possibility of having bacteriological contaminants on poorly processed suya which may in turn constitute hazards to the health of final consumers. According[10] some minerals, as well as flavoring and color, are added to plant-based meat to give it the desired sensory attributes. These ingredients do not go through thermal processing and may introduce microorganisms to the final products. They may in turn affect man. Also according to[11] based on the modelling prediction, pathogens grow the best in GB (ground beef), followed by PBM (Pea-based meat) and then SBM (Soy-based meat). To provide a more comprehensive prediction on complex food such as plant-based meat analogues, factors including dynamic temperature/pH change, microbial interactions, and types of plant-based protein should be considered for the future model.

Possible source of contamination

This study and research team visited the processing site of these suya. The following were noted as reasons for the contamination.

1. The beef was not boiled before roasting
2. The water they use in washing was reported to be absolutely contaminated.
3. One dirty and unwashed knife was used for cutting of the beef
4. The containers used in the processing are open and dirty.
5. Health status of the cow from which the beef was got cannot be ascertained.
6. The Abokis (suya seller) are not well dressed
7. The sellers use old, waste, discarded and dirty paper to wrap the suya for their costomers.
8. After each sell, the vendors will wipe the knife with a dirty cloth.

Also, linear microbial predictive models have been used previously to predict the growth of Listeria monocytogenes in ready-to-eat foods and the survival of common foodborne pathogens in dried fruits.[12]

Conclusion and recommendation

Since the source of these isolates are traced from slaughter house to processing house. There is need to monitor this special delicacy. The following are recommended;

a. Health workers should inspect the cow before and after slaughtering.
b. Adequate and clean water should be provided at the abattoir.
c. The beef should be boiled first
d. The Abokis (suya sellers) should stop the use of waste paper in selling the suya to costomer as there is the possibility that the papers are not sterile.

e. People should heat the suya with microwave or oven before eating.

Acknowledgments

Conflicts of interest

There is no conflict of interest in this research work.

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