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BACTERIOLOGY OF SUYA MEAT SOLD IN BONNY LOCAL GOVERNMENT AREA, RIVERS STATE.

ABSTRACT

Suya Meat is obtained from roasted or smoked beef and other boneless part of an animal. They have good taste and rich in protein, vitamin B12, zinc, selenium, niacin, iron, and phosphorus. Suya meat is commonly found in most streets as source of food in Nigeria. Processing the meat involves defat and slicing the meat on a table top into smaller portions before it is roasted for few minutes. The spice is basically made up of pepper, magi, groundnut, salt (Kuli kuli), vegetable oil, peanut and some flavor been done or roasted on hot charcoal fire and served hot with onions sections or chopped, fresh tomatoes and fresh pepper. Suya could be contaminated from air, handlers, equipments, water, papers and some kitchen utensils for example the spoon, trays, and knives. Factors affecting the growth of microorganisms on meat could be intrinsic or extrinsic factors. Aim to determining the bacteria contamination of roasted suya meat sold in Bonny local government area. Culture characteristics of colonies were considered after 24hrs incubation period, visible colonies on all media used were observed and identified based on specific features. The locations were: Tennis Hut, Golf Club, Ama hausa, Hospital Road, (round about), Finima market junction and Akiama respectively. Total of five (5) different suya sample meat (stick) was collected at random, from each of these six suya location or stand at different time of the day respectively, which sum up the number to total of 30 suya meat samples assayed. All the 30 suya samples worked on show positive results, with different microbial contaminations and distribution. Results shows that the total number of *Bacillus cereus* and *Salmonella species* presence were 10 (34) and 5(17) respectively, from the five suya samples each, across the six suya stand in Bonny local government area. *Escherichia coli* have no growth recorded from the five suya samples each, across the six suya stands. The total of 1(3.4) and 2 (6.8) of *Staphylococcus aureus* and *Klebsiella species* respectively were also isolated. Total value of 6(20) and 5(17) of *Enterococcus species* and *Proteus species* respectively were also isolated. However, the results also shows that Tennis Hut and Golf club have total of 3(9.6) and 2(6.4) of different types of microorganisms isolated. Finima suya and Akiama have total of 7(22) and 6(19) respectively of different type of microorganisms isolation. Finally, the total result from Ama Hausa and Hospital road roundabout were 8(25) and 5(16) respectively, shows different type of microorganism associated with suya meat sold in Bonny local government area of Rivers state.

KEYWORDS: BACTERIOLOGY, SUYAMEAT, BONNY LOCAL GOVERNMENT AREA RIVERS STATE.

INTRODUCTION

Suya Meat is obtained from roasted or smoked beef and other boneless animal mostly. They are good, taste and rich in protein, vitamin B12, zinc, selenium and phosphorus. It is also rich in niacin, iron and vitamin (pyridoxine). Suya meat is commonly found in most streets as source of food in Nigeria and sub-Sahara Africa (Abdullahi *et al.,* 2004).

Based on that suya meat contaminate is associated with the exposure on the street. It is easily contaminated with bacteria, microorganisms and parasite. The meat (suya meat) is produced from meat part from animals. The meat part from this animal is roasted smoked to dry making it attractive to eat and increasing the shelf life of the suya meat (Abdullahi *et al.,* 2004).

Therefore, it is necessary to carried out some microbiological and parasitic quality assessment in order to ascertain their safety for consumption. Suya could be contaminated from air, handlers, equipments, water, papers, some kitchen utensils for example the spoon, trays, knives and sometimes the contamination could be due to nature of the vendors and the environments (Edema *et al.,* 2005).

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Suya meat is commonly produced among Hausa in West Africa and it is gotten from beef. In some cases chicken can be used. The suya meat which could be meat from beef or chicken preferably, the boneless section of the meat is section into smaller portions and spiced with salt, vegetable oil, peanut and some flavor been done or roasted on hot charcoal fire. The fire or smoke from the charcoal function to preserved or reduced the Water Availability (AW) and some possible contaminations of the suya meat (Judge *et al.,* 2002).

In the abattoirs during slaughtering, there is the chance of contaminating sterile tissue of the meat, with some intestinal flora, for example *Escherichia coli* gram negative organism, *Pseudomonas species, Lactic acid, Staphylococcus species* which are associated with humans, animals and the environment (Nester *et al.,* 2001).

These factors could be intrinsic or extrinsic factors. For example, temperature, pH, water availability (AW), presence of nutrients, moisture, acidity. The extrinsic factors include gaseous requirement and atmosphere of storage (Nester *et al.,* 2001).
The source of water for abattoir activities is very important to meat hygiene as water is needed in the washing of blood from the meat and work surfaces (Fasanmi *et al.,* 2010). Meanwhile, water pollution could be defined as the contamination of water bodies for example, the lakes, rivers, oceans and ground and underground water (Hughes & Koplan, 2005).

It is believed that raw consumption of uncooked meat could result to food poisoning. This is possible based on the presence of some bacteria in the meat which has the ability to produced some toxins in human resulting to some pathological condition like diarrhea and vomiting (Sonal & Chagan, 2016).

However, the infectious doses of some common contaminations of meat were still under debate or investigations (Sonal & Chagan, 2016).

However, the epidemiological evidence of out breaks in suya-borne disease is not too common (Ogbonna *et al.,* 2012). In spite of some regulatory agencies in Nigeria, for example the National Agency for food and Drug Administration and controls (NAFDAC) and the Standard Organization of Nigeria (SON) which function to regulate food productions in Nigeria, but it have been shown and proven that most suya meat producer do not follow the recommendation of the food and drug agencies, which means that they fall short of the dictates of HACCPs (Hazard analysis of critical control points) and ISO (Internal Standard Organization) recommendations (Ogbonna *et al.,* 2012).

Based on the fact that microorganisms could be found everywhere, it's believed that unhygienic preparation of suya meat, could promote the presence of microorganism on suya meat sold in Bonny, which could cause contamination to the consumer. It is based on these; my research will ascertain some possibilities towards recommending ways to reduced possible health hazards that could be associated with the consumption of suya meat sold in Bonny.

This work is aimed at determining the bacteria contamination of roasted suya meat sold in Bonny local government area.

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MATERIALS AND METHODS

This study will be conducted within the City of Bonny (Ibani) Local Government Area of Rivers state in the month of November to December, 2016. Bonny local government area is situated at the southern edge of Rivers State in the Niger Delta of Nigeria near Port Harcourt. Bonny features a tropical monsoon climate with lengthy and heavy rainy seasons and very short dry seasons temperatures throughout the year, relatively constant and the average temperatures are typically between 25 – 28^0C, The geographical location is latitude 40 26^1 $N7^0$ 10E. The major occupation of the people is fishing and farming and they speak Ibani language.

The population for this study was drawn from six (6) selected suya stands namely; Tennis Hut, Golf Club, Finima market Junction, Akiama, Ama-Hausa and Hospital Road (roundabout junction). A total of thirty (30) samples were collected for the study, five from each suya stand location at different time and day.

All suya meat samples from each was aseptically collected into a sterile container, labeled and taking to Nigeria Liquefy Natural Gas (NLNG) company medical laboratory section and department of Medical laboratory science, Rivers state University to analyzed and cultured into various culture media, strictly following the protocol for media inoculation and organism identification guide for bacteriology culture in medical laboratory within (six) 6 hours of collection.

The materials used include: Sterile universal containers, B jou bottles, sterile disposable wire loops, Petri- dishes, Media, Peptone water, Incubator, Autoclave and Test tubes.

The media was prepared according to the manufacturer's instruction. Based on the number of plates, sterilized by autoclaving at 121°C for 15 minutes and dispensed aseptically into disposable Petri- dishes (about 20mls each) after cooling to about 50°C. Brilliance *Salmonella* Agar Base, Blood Agar, MacConkey Agar Medium, Brilliance Bacillus Cereus Agar Base and Brilliance *Bacillus cereus* Agar (Formerly called chromogenic medium) was used for the isolation and differentiation of *Bacillus cereus* from suya meat samples. Desoxycholate Citrate Agar (DCA) Desoxycholate citrate Agar is a selective medium recommended for the isolation of enteric pathogen particularly *Salmonella* and *Shigella species*. Chromagar 0157 media is for the selective isolation and differentiation of *Escherichia coli* - 0157 in food and clinical samples. Finally *Salmonella – Shigella* (SSA) Agar and Meat Extract Broth were also used.

The sample was incubated aerobically in the incubator for 24hours. Sub-culture was done the following day into various media. The plates were incubated at 37°C for 12 -24 hours and examined for bacterial growth. Biochemical and gram staining test for proper identifications.

Statistical Analysis, The data were analyzed statistically using percentages.

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122 **RESULTS**

123 **4.1 Table showing the total number of microorganisms isolated from six different suya locations in Bonny local government**

124 **area.**

Organisms Isolated	**Tennis Hut (%)**	**Golf Club (%)**	**Finima (%)**	**Akiama (%)**	**Ama hausa (%)**	**Hospital Road (%)**	**Total (%)**
Bacillus cereus	2(66)	1(50)	3(42)	2(33)	2(25)	2(40)	**10(34)**
Salmonella species	1(33)	00(00)	2(28)	00(00)	2(25)	00(00)	**5(17)**
Escherichia coli	00(00)	00(00)	00(00)	00(00)	00(00)	00(00)	**00(00)**
Staphylococcus aureus	00(00)	00(00)	00(00)	1(16)	00(00)	00(00)	**1(3.4)**
Klebsiella species	00(00)	00(00)	00(00)	1(16)	00(00)	1(20)	**2(6.8)**
Enterococcus species	00(00)	1(50)	00(00)	1(16)	2(25)	2(40)	**6(20)**
Proteus species	00(00)	00(00)	2(28)	1(16)	2(25)	00(00)	**5(17)**

Total	**3(9.6)**	**2(6.4)**	**7(22)**	**6(19)**	**8(25)**	**5(16)**

125 **Percentage of Microorganisms Isolated from the Six different Locations; Tennis Hut, Golf Club, Finima, Akiama, Ama hausa and Hospital Road**

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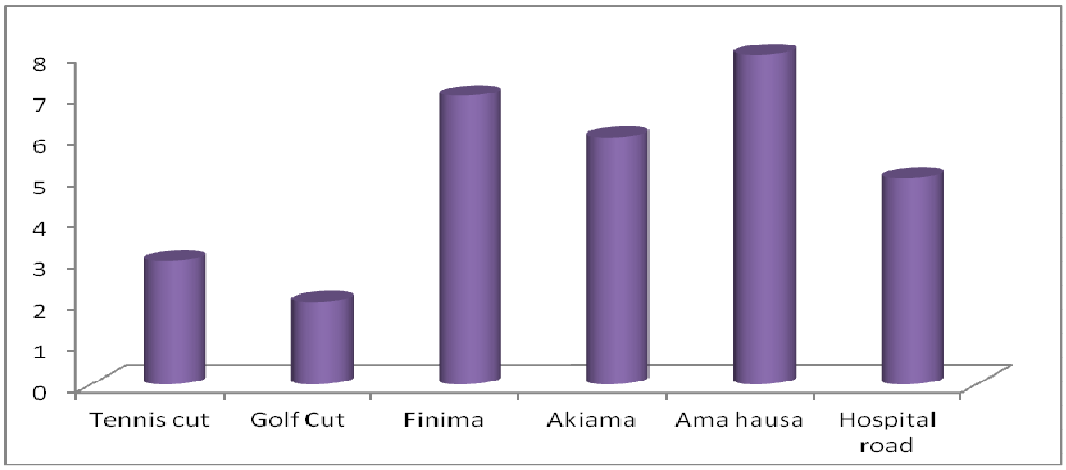

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129 **Fig. 4.1: Graph showing the six different suya stand in Bonny local government area.**

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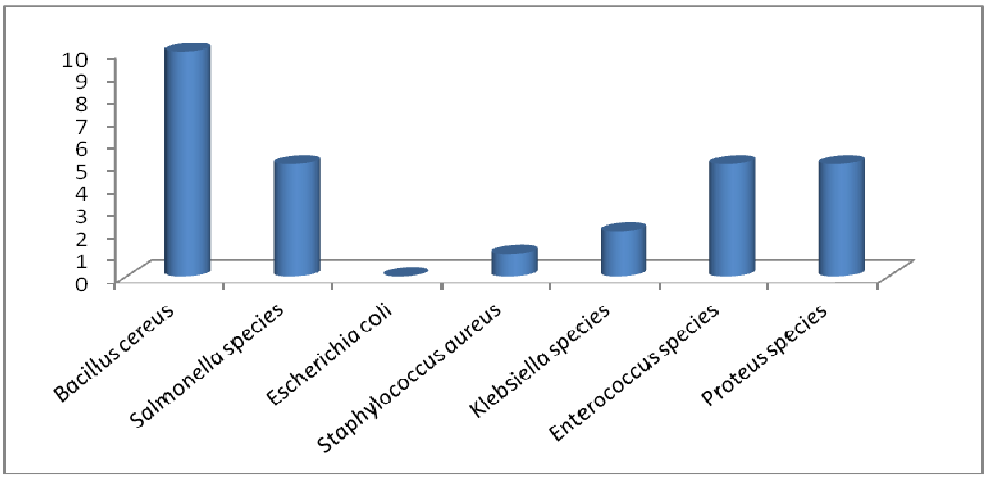

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137 **Fig. 4.2 : Graph showing a total number of microorganism isolated across the six**
138 **suya stands.**

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Result shows that from the 30 (thirty) samples of suya meat brought from six different locations in Bonny Local Government Areas of Rivers state, were all positive with different microbial contaminations and distribution. The presence of *Bacillus cereus* 2(66) and *Salmonella species* 1(33) given a total of 3(9.6) and 10(34) of different microorganism isolated and total number of Bacillus cereus isolated across the six suya stands in Bonny. These agreed to the improper establishment of a Hazard Analysis Critical Control Point (HACCP) sparker & Richard, (2001), which is also essential for the control of *Salmonella species*, *Enterococcus species* and *Proteus species*

According to sparker & Richard, (2001) the method could be used to achieved the potential food safety hazard or could be taken to reduced or totally eliminates the presence of these organisms contained in the meat, may be from the abattoir personnel or the environment.

The Golf Club suya sample assayed indicates that 1(50) was contaminated with *Bacillus cereus* and 1(50) of *Enterococeus species,* given a total of 2(6.4) of different microorganisms and total of 6(20) of *Enterococcus species* across the six different suya sold in Bonny. It is believed that *Bacillus cereus* can cause two types of illness, one characterized by diarrhea and vomiting with the aid of their enterotoxins. Though the diarrhea enterotoxin is heat sensitive (could be inactivated by 56^0C heat for 5 minutes). But the emetic toxin which induces vomiting is very heat resistant (Sperder & Richard, 2010).

Bacillus cereus, a gram positive, facultative aerobic spore forming rod which are different from other *Bacillus species* in their cell position and biochemical test with their optimum growth temperature of about 30^0C to 50^0C, pH value of 4.3 to 9.3 and water activity (AW) values of 0.912. *Bacillus cereus* is commonly found in nature for example in the soil and water. The infective dose of *B. cereus* could be more than 10 cfu (gm) of visible cells consumed to cause disease (Sperder & Richard, 2010).

The result gotten from Finima, shows that 3(42) of *Bacillus cereus,* 2(28) of *Salmonella species* and 2(28) of *Proteus species* were positives given a total of 7(22) of different types of microorganisms, and total of 5(17) of *Proteus species* present across the six suya stand sold in Bonny. *Salmonella* species could be gotten from uncooked cow meat or taking raw cow meat that is improper cooked could be harmful to human health (Rysend & Marth, 1989).

Akiama, also shows 2(33) of *B. cereus, Staphylococcus aureus* 1(16), *Klebsiella species* 1(16), *Enterococcus species* 1(16) and *Proteus species* 1(16) given a total number of 6(19) different microorganism, and total of 1(3.4) and 2(6.8) of *Staphylococcus aureus* and *Klebsiella species* isolated across the six suya stands in Bonny.

The presence of *Staphylococcus aureus* in suya meat from Akiama indicates *Staphyloccus aureus* gram positive coccal bacteria has high salt tolerance and can grow in meats and other dairy products. *Staphylococcus aureus* also produces toxins which are heat resistant and cannot be destroyed through cooking. It is commonly contracted through food workers. An individual with weakened immune systems may also be vulnerable to it toxins which agreed with Ryser & Marth, (1989). Because *Staphylococcus aureus* are commonly found on the skin, hair, nose and human throats, the bacteria could be found in up to 25% of healthy individual and are more common with those individual that has nose, skin, eye and throat infections (Ryser & Marth, 1989).

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Ama Hausa results show contamination of suya meat of 2(25) *Bacillus cereaus, Salmonella species* 2(25), *Enterococcus species 2(25) and Proteus species 2*(25) given a total of 8(25) of different microorganisms contamination in Bonny.

Finally, suya meat picked from Hospital road shows that *Bacillus cereus* has 2(40), *Klebsiella species* shows 1(20) and *Enterococcus species* 2(40) positive out of the total of 5(16) of different microorganisms in suya meat from Hospital road in Bonny Local Government area. The presence of *Proteus species* agreed with the fact that, it is commonly found in the human intestinal tract as part of normal flora, and it is also found in multiple environmental habitats, it is a gram-negative bacillus which also colonized both the skin and oral mucosa.

Bacillus cereus with total of 10(34) was isolated across the six suya stand in Bonny making it the highest among other microorganism found from the suya sample. This confirmed the statement by Sperder & Richard, (2010), that *B. cereus* has the ability to produce spores which can also germinate if the temperature is lowed, make it to be temperature tolerance.

Salmonella species and *Staphylococcus aureus* with the total of 5(17) and 1(3.4) respectively indicates that both organisms could also cause poison to human when consumed in their high infective dose. This confirmed Diana *et al*., (2012), that says the infective dose could be as little as 1.0 nanogram of the toxin per gram of food or meat will produce illness. Ingestion of 1 – 5 microgram of the toxin has been shown to be associated with many outbreaks of diseases (Diana *et al.,* 2012).

Klebsiella species, Enterococcus species and *Proteus species* have total of 2(6.8), 6(20) and 5(17) respectively isolated from the six different suya stand in Bonny local government area. But the infectious dose of *Klebsiella species* is still unknown and it is found widely through nature in soil and water so there is that likelihood that suya contaminated with *Klebsiella species* could be from soil or water source, human skin and mouth (Diana *et al.,* 2012).

Finally, *Escherichia coli* were negative across the six suya meat stand in Bonny, with the use of Chromagan 0157 media for isolation and differentiation of *E.coli* organisms and there was no growth noticed.

In a way to reduce or total elimination *Bacillus cereus* organism which also have contributed to some resistant noticed in the used of our antibiotics, the authority appointed to over seer the proper preparation of our abattoir meats and suya processing should adhered to required principle by law. Also one need to stored perishable food like the suya meat within the temperature "danger gone" at the range of 50^0C to 60^0C. Suya meat should be reheated to above 75^0C before eating.

Studies have also shown that food handles especially suya meat handless can also serve as a source of infection and the hand contact with the suya represent the means by which the contamination may occur.

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