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Assessment of microbial load of okpa (A locally vended food) from parts of owerri urban

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Abstract
The microbial load of Okpa (Bambara cake) from two different vendors in Ekeukwu market and in Amakohia market was assessed. The total colony count ranged from 1.2 x 10^7 to 2.8 x10^7 CFU/g. Three bacteria were isolated: *Enterobacter specie*, *Staphylococcus specie* and *Escherichia specie.* Okpa from Ekeukwu market was found to have more microbial load and more microorganisms compared to Okpa from Amakohia market. The results of this study indicated that most Okpa samples examined did not meet bacteriological quality standards. Hence, it is recommended that consumer's awareness on the dangers of consuming contaminated foods, education of food vendors on food hygiene and application of hazard analysis critical control point is imperative.

Keywords: local food, public health, coliforms, pathogens, contaminated foods, ready-to-eat foods

Introduction

Street-vended foods or its equivalent "street foods" are defined as foods and beverages prepared and sold by vendors on streets and other public places for immediate consumption or consumption at a later time without further processing or preparation. (Abdussalam and Kaferstein 1993) [1].

Urbanization and population growth, especially in developing countries, are expected to continue into the next century and street-vended food, which are largely but not exclusively an urban phenomenon will expand accordingly. Food either raw or cooked, hot or chilled that are ready for immediate consumption at the point of sale without further treatment are generally described as "ready-to-eat. (Tsang, 2002). The Food and Agricultural Organization (FAO) defined street food as ready-to-eat foods and beverages prepared and, or sold by venders and hawkers especially in streets and other similar public places. (FAO, 1989) [13].

Okpa is one of the foods of the South East, the Igbo land. Okpa is to the Igbo man what tea and bread is to the white man. Some people in Igbo land Cherish Okpa so much that other parts of Igbo land make fun of them by saying that instead of bread, the Wawa people drink tea with Okpa. By Wawa people, they are referring to the people of Enugu state. "Okpa" is a well-cherished food, especially among the inhabitants of the eastern part of Nigeria. However it is derived from Bambara nuts (voandzeri subterranean thouars) which is the botanical name synonyms of Vigna Subterranean and belongs to the plan tea of the family of *pabaceae*and subfamily of *fabiodea.* It is a legume, and indigenous to the tropical Africa. (Kay, 1979) [17].

Vendors are often poorly educated, unlicensed, untrained in food hygiene, and they work under crude unsanitary conditions with little or no knowledge about the causes of food borne disease. Most of the foods are not well protected from flies, which may carry food borne pathogens. Safe food storage temperature are rarely applied to street food potential health risks are associated with contamination of food by *E. coli*, *Salmonella typhi*, *Pseudomonas species*, *Staphylococcus aureus* and *Proteus species*, during preparation, post cooking and other handling stages. Even though people are aware that food borne diseases could occur due to consumption of street food, the majority disregards these health hazards. (Barth 1983).

The street food industry plays an important role in meeting the food requirements of urban dwellers in many cities and towns of developing countries and the industry feeds millions of people daily with a wide variety of foods that are relatively cheap and easily accessible. So, those food borne illnesses of microbial origin are a major health problem associated with street foods. Food borne illness of microbial origin is a major international health problem associated to food safety and an important cause of death in developing countries. The consumers who depend on such food are more interested in its convenience than in question of its safety, quality and hygiene (Alkinson 1992) [3].

The attempt was made to analyze of street-vended food like Okpa sold in part of Amakohia and Ekeukwu Owerri by street venders for microbial load count. The FAO defined street food as ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other similar public places (FAO, 1989) [13].

'Migratory' ready-to-eat food vending along high ways linking various geographical regions or states of Nigeria is an emerging new form of food vending resulting from high level of unemployment and failed family and community values. The trade is encouraged by travelers who are often delayed or trapped on high ways for long hours or days due to failed road infrastructure (multiple pot hole) coupled with multiple

security check points necessitated by increase high way robbery, smuggling activities through the high ways and revenue generation by various government agencies. A general observation of our society shows a social pattern characterized by increased mobility due to urbanization, large number of itinerant workers and loss family or home centered activities resulting in large percentage of the population depending on ready-to-eat foods for employment and food. This situation however, has resulted that food sanitary measures and proper food handling have been transferred from individual, parities to the food venders who rarely enforce such practices (Musa and Akande, 2002 Draper, 1996) [11].

Materials and Methods

Distilled water, test tubes, petridishes, wireloop, beaker, conical flask, Burnsen burner, autoclave, weighing balance, masking tape, nutrient agar, macConkey agar, mannitol salt agar, sabouraud dextrose agar, hand gloves, face mask, 90% ethanol, spatula, Pasteur pipette, syringe, cotton wool, samples (Okpa; Bambara cake), Incubator.

Methods

Wholesome samples were collected aseptically in a sample container from the sampling points; Ekeukwu and Amakohia Markets respectively and labeled as A and B. The collected samples are maintained at 4°C to insure viability while it is being transported to the laboratory for analysis.

Media preparation

The following media were prepared according to manufacturer's prescription: nutrient agar media, macconkey agar media, mannitol salt agar media, and sabouraud dextrose agar media respectively.

The agar media in the conical flasks were labeled with masking tape, the lid was covered with the aid of cotton wool and aluminum foil, then banded with masking tape to avoid cross contamination from any source. It was placed in an autoclave for sterilization at 121 °C for 15minutes. After sterilization, the media was be poured (1ml for each) into different petridishes and allowed to cool and solidify. The petridishes were labeled appropriately.

Sample preparation and serial dilution

20g of Sample A from Ekeukwu market Owerri was weighed, and grinded with the addition of distilled water, and was made into slurry. 180ml of distilled water was added to the prepare sample A, to obtain the stock solution. This procedure was repeated for sample B (sample from Amakohia market).

Serial dilution

10 test tubes were set in a test tube rack and labeled as 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}, 10^{-8}, 10^{-9}, and 10^{-10} respectively. 9mls of distilled water was added to all the test tubes with the aid of a glass pipette. 1 ml of the stock solution labeled A was transferred with the aid of a Pasteur pipette into the first test tube labeled 10^{-1} subsequently, 1ml was transferred from the first test tube to the next test tube labeled 10^{-2} till the last test tube(10^{-10}). This procedure will be repeated for sample B (Okpa from Amakohia market).

Culture (spread plate method)

0.1ml of 10^{-3} and 10-6 diluents were respectively inoculated on different nutrient media plates. This procedure was also repeated on macconkey, mannitol salt and sabouraud dextrose agar medium respectively for sample A. The inoculums on the media were spread evenly on the surface of the media with the aid of an L-shaped spreader. The media was covered, labeled and incubated upside down at 37 °C for 24hours. This procedure was also repeated for sample B (Okpa from Amakohia market).

Results and Discussion

Table 1: Plate count results of sample A (Ekeukwu market)

Samples/Media	No of Colonies	Microbial Load
A_1/Nutrient agar	136	1.36 x 10^8CFU/g
A_2/MacConkey agar	46	4.6 x 10^7 CFU/g
A_3/Mannitol salt agar	14	1.4 x 10^7CFU/g
A_4/ Sabouraud Dextrose agar	12	1.2x10^7 CFU/g

Table 2: Plate count results of sample A (Amakohia market)

Samples	No of Colonies	Microbial Load Cell/g
B_1/Nutrient agar	12	1.2 x 10^7CFU/g
B_2/Maca Conkey agar	28	2.8 x 10^7CFU/g
B_3/Manitol salt agar	22	2.2 x 10^7CFU/g
B_4/Sabour dextrose agar	21	2.1x10^7 CFU/g

Table 3: Morphological Characteristics

Morphology	Isolate A	Isolate B	Isolate C
Shape	Circular	Circular	-
Size	Small	Large	-
Colour	Pink	Golden yellow	Colourless
Margin	Complete	Entire	
Elevation	Slightly raised	Convex	Irregular
Texture	Soft	Rough	Thick
Opacity	Translucent	Opaque	Translucent

Table 4: Biochemical characteristics

Biochemical test	Isolate A	Isolate B	Isolate C
Glucose	+	+	
Oxidase	_	_	_
Citrate	_		+
Vogesprauskeur	NA	+	+
Coagulase	_	+	_
Catalase	_	+	+
Indole	+	_	_
Methyl red	+	_	_
Lactose	+	+	
Gram reaction	_	+	_
Suspected organism:	*Escherichia specie*	*Staphylococcus specie*	*Enterobacter specie*

Discussion and Conclusion

The result obtained is as presented in table 3.1 and 3.2. The microbial count recorded a highest count of 1.36 x 10^8 CFU/ml in sample A_1 and lowest of 1.2 x 10^7 CFU/ml in sample B_1 than, there were growth recorded in sample A_2, A_3, A_4, and B_2, B_3 B_4 high microbial load in Okpa can be attributed to inadequate hygienic measures in production or inadequate processing recontainatic (Diasty and Kaseh, 2009).

The samples recorded counts that ranged from 1.2 x 10^7 to 1.36 x 10^8 cell1ml which fell above the acceptable limit of 10^3 to 10^4 as in the guide lines for the microbiological quality of Okpa food sample at point of sale (Gilbert, 2000), the count recorded was an indication of contamination of the product either during packaging or at the preparatory stage or during handling.

Species of *Escherichia, Enterobacter* and that of *Staphylococcus* were identified from the samples. The presence of *Staphyloccocus specie* could be contamination from the mouth saliva as reported by (Younus, 2009). The presence of *Escherichia specie* was reported to be Entero pathogenic (*Escherichia coli),* and this have been incriminated as a potential food poisoning agent and are associated with infantile diarrhea and gastroenteritis in adults (Okpalago, 2008).

In most foods, the total bacterial count is often an indication for the sanitary quality, safety and utility of foods. It may reflect the conditions under which the product is manufactured such as contamination of raw materials and ingredients, the effectiveness of processing and the sanitary conditions of equipment and utensils at the processing points (ICMSF, 1986).

The biochemical test result was presented in table 3.4. The isolated colonies were subjected to gram reaction, indole, coagulase, catalase, citrate, vogesproskaur, methyl red, lactose, oxidase and glucose tests respectively. *Enterobacter specie*showed positive to catalase test, vogesprauskeur test, and citrate test while negative to coagulase, indole, oxidase and methyl red test, it also tested negative for gram reaction. *Escherichia specie* showed positive for indole, glucose, methyl red, and lactose tests, while negative for oxidase, citrate, coagulase and catalase tests, it also tested negative for gram reaction. *Staphylococcus specie* showed positive in vogesprauskeur, coagulase, catalase, methyl red, and lactose test, it also tested positive for gram reaction. While negative results were observed with the same isolate on indole and oxidase testes respectively. The overall results of this study indicate that, majority of the street vended Okpa in many parts of the city showed contamination with microorganisms. Based on the results from this study, there is need for strict hygienic measures to be applied during production, processing and distribution of Okpa and its products to avoid contamination. Periodic factory inspection must be done by regulators in the food industry such as NAFDAC, SON and CPC to checkmate the problem of poor hygiene and to apply sanctions where necessary.

Conflict of interest

The authors declared that there are no conflict of interest regarding the publication of this manuscript

References

1. Abdussalam M, Kaferstein. Safety of Street Foods World Health Forum,1993:14:191-194.
2. Akinjaju O, Enude OJ. Properties of Bambara (Voandzeia Subterrunean Thour) Flour. *Halian Journal of Food Science*,2002:14(1):53-58.
3. Alkinson. Is Food Poisoning a Clinical or Laboratory Diagnosis? A survey of Local Authority. Practices in the South Thames Region. Commun Dis Public Health,1992:1:61-66.
4. Alobo AP. Production and Assessment of MoiMoi from Bambara Groundnut (Voandzeia Subterranean L. Thours) Plant Food for Human Nutrition,1999:53:313-320.
5. Boyce TG, Kood. Microorganisms Associated with Ready-to-eat Rice. *Epidemiol. Infect*,1996:117(1):29-33.
6. Brath. Problems in the Diagnosis of Food borne Infection in General, 1983.
7. Chomvarin C, Chantarasak Y. Enteropathogenic Bacteria and Enterotoxin Producing Stamphylococcusaureus Isolated food Read-to-eat Food in Khon, Thailand South East. J Troop Med Public Health,2006:37(5):983-985.
8. Codex. Revised Regional Guidelines for the Design of Control Measures for Street Vonded Foods in Africa. CAC/GL -22-ev, 1999.
9. De Bess EE. Food Handlers Assessment in Oregon, Food borne Patogen Dis,2008:6(3):329-335.
10. De Rover C. Microbiology Safety Evaluation and Recommendation on Fresh Produce. *Food Control*,1998:9(6):321-347.
11. Draper A. Street Foods in Developing. Countries: The Potential for Micronutrient Fortification. Johsnow, INC/OMNI) Project London School of Hygiene and Tropical Medicine, 1996.
12. Ehiwe A, Pelchert. Variability in Quality of Bambara Groundnut and other cereals. *Cereals Chemistry*,1987:64:86.
13. FAO. Street Foods. A Summary of FAO Studies and other Activities Relating to Street Foods: Rome, FAO, 1989.
14. Fehd. Microbiological Guide line for Ready-to-eat Food. Food and Environmental Hygiene Department, Queensway. *Hengkong*, 1995, 1-6.
15. Gilbert RJ, De-Louvois J. Guidelines for the Microbiological Quality of some ead-to-eat foods samples at the Point of Sale. *Communicable Diseases and Public Health*,2000:3:163-167.
16. Hanashiro A. Microbiological Quality of Selected Street Foods from a Restricted Area of Sao Pualo City, Brazil, Food Control,2004:16(95):439-444.
17. Kay DE. Food Lequmes Crop and Product digest No. 1. London: TPI, Nigeria Food Journals (2007) Different Methods of Producing Bambara Flour for Making Moi-Moi,1979:25(2):142. (www.ajol.infor/journals/nifog) ISSN 0189.
18. Masa OL. Effect of Health Education Intervention on Food Saftey Practices Among Food Venders in Llorin. Sahel Med J,2002:5:120-124.
19. Mensah P. Street Foods in Accra, Ghana-How Safe are they? Bull. *WHO*, 2002:80:546-554.
20. Nichols GL. The Microbiological Quality of Cooked Rice and Take Away Premises in the United Kingdom. Food Prot,1999:62(8):377-882.
21. Obizoba IC, HI Egbuna. Nutritional Quality of Bambara Nut (VoandzeraSubtrerraean, L. Thousars) and its Product Plant. *Foods Human Nutr*,1992:42:13-23.
22. Okeke EC. Igbo Traditional Food System: Documentation, Uses and Research Needs: Pakistain J. Nutr,2008:7(2):365-376.

23. Olapade AA, Ug okwe PU. Proximate Analysis of Premixes for Preparation of Okpa. Nigerian Food Journal,2005:22:54-59.
24. Practice. *Epidemol infect*, 117:479-84 Public Health 3:163-167.
25. Reddy, Ram. Food Safety Issues arising in Food Production in a Global Market. Journal of Agricultural Business,2000:18(1):129-133.
26. To-eat-food Samples at the point of Sale.*Communicable Disease and* Tsang D. Guidelines for the Microbiological quality of some ready, 2000.
27. Udensi *et al*. Food of plant origin: processing and utilization with recipes and Technology profile. *Afro-orbits publishers Nsukka, Nigeria*, 1999, 59-61.
28. WHO. Essential Safety requirement for Street – Vended Food. Unpublished Document WHO/FNU/FOS, 1996:96:7. Revised Edition, Geneva.