Microbiological Quality of Some Ready-to–Eat Foods Sold By Selected Food Vendors in Federal Polytechnic Offa, Nigeria

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ABSTRACT

The microbiological quality of some ready -to -eat food sold the campus of The Federal Polytechnic, Offa, Kwara State, Nigeria was assessed in this study using standard microbiological methods. Sixty samples was collected from major vending food site within the campus. In this investigation, the total bacterial count for the food samples ranged from nil to 7.6 x 104 cfu/ml, while the mean fungal counts ranged from 1.0 x 102 sfu/ml to 3.3 x 104 sfu/ml. The isolated organisms from food samples were, Bacillus cereus, Escherichia coli, Klebsiella pneumonia, Staphylococcus aureus Shigella spp, Salmonella spp, Aspergillus flavus, Mucor mucedo, and Rhizopus stolonifer. It is conceivable from the outcome of this research, that application of Good Hygiene Practices (GHP) and Hazard Analysis Critical Point (HACCP) in food preparation is imperative.

Keywords: Microbiological Quality, Ready-to–Eat Foods, Food Vendors, Federal Polytechnic Offa, Nigeria

iSTEAMS Proceedings Reference Format
Olafimihan, C.A. & Awe, A.S. (2019): Microbiological Quality of Some Ready-to–Eat Foods Sold By Selected Food Vendors in Federal Polytechnic Offa, Nigeria. Proceedings of the 19th iSTEAMS Multidisciplinary Conference, The Federal Polytechnic, Offa, Kwara State, Nigeria. 7th – 9th August, 2019. Pp 71-76. www.isteams.net/offa2019 - DOI Affix - https://doi.org/ 10.22624/AIMS/iSTEAMS-2019/V19N2P8

1. INTRODUCTION

Safe food is fundamental to human existence, many foods is often contaminated with pathogenic microorganisms that is found naturally in foods. This microorganisms found in food cannot be identified organoleptically, but the disease the cause varies in severity, including death especially the way foods are kept during sales provides suitable environment for those microorganisms to grow and reach significant levels of contamination (Tsang, 2002). Thus, the safety of foods are central to world health (WHO, 2007). Ready to eat (RTE) depict food that is ordinarily consumed in the same state in which it is sold or distributed, it could be raw or cooked (Tsang, 2002). The consumption of ready -to -eat food have increased drastically duo to a change in social patterns, which characterized by increased mobility, large numbers of itinerary workers and less family centered activities.

Thus, good manufacturing practices of foods taken outside the home have been transferred from individuals/families to the food seller which do not often implement such practice (Musa and Akande, 2002). The occurrence of food infection is on the increase globally (Kaneko *et al*., 1996; Mead *et al*., 2009; Nguz, 2007). High counts of indicator organisms in foods often shows lack of good manufacturing practices hygiene in handling and production operations, inadequate storage and post-process contamination (De Sousa *et al.,* 2002). The objectives of this study is aimed to determine the microbiological quality of ready to eat food produced and sold in cafeteria within Federal Polytechnics Offa premises and to ascertain whether these foods meets the acceptable microbiological standards and specification for foods

2. MATERIALS AND METHODS

Sample collection

A total of 60 samples comprising of fifteen each of some ready to eat foods were collected from major food vending sites within the mini campus of the Federal Polytechnic Offa, Nigeria. The selected foods included beans, moin moin (bean pudding), rice and soups. The freshly prepared samples which were purchased, collected into sterile specimen containers, and transferred under aseptic condition to the Microbiology laboratory in the Department of Science Laboratory Technology, Federal Polytechnic Offa, Nigeria for analysis within forty five minutes of collection.

Preparation Of Samples

Ten (10) grams of each food sample was homogenized with 90 ml sterile normal saline. Further five-fold serial dilutions of the resultant homogenates were made to obtain 10^{-2}, 10^{-3}, 10^{-4} and 10^{5} respectively. From the appropriate dilutions, 0.1 ml was plated in replicate onto different media using pour plate technique. Nutrient agar, eosin methylene blue agar and mannitol salt agar, and *Salmonella Shigella* agar were inoculated for aerobic plate count. Potatoes - dextrose agar was used for isolation of fungi. All inoculated plates were incubated at 37°C for 24-48 hrs except, however, potatoes - dextrose agar plates that were incubated at 28°C for 72 hrs. After the incubation periods, colonies were counted using colony counter. The counts for each plate were expressed as colony forming units per gram of sample homogenate (cfu/g) for bacteria and (sfu/g) for fungi. Morphological characteristics of the colonies on the media were observed; discrete colonies on the different media were isolated and repeatedly sub-cultured on nutrient agar. Pure cultures were stored on agar slants at 4°C for further characterization.

Coliform test

Presumptive test:

One (1) ml of each sample homogenate was transferred to sterile test tubes containing Lactose broth and inverted Durham tubes. Incubation was for 24-48hrs at 37°C before tubes were checked for gas production.

Confirmatory test:

A loop full of inoculum from the gas positive tubes was streaked onto eosin methylene blue agar plates. Incubation was at 37°C and 44°C for 24 hrs. After incubation, colonies which showed bluish black colour with green metallic sheen and reddish/brown colonies were noted and isolated on agar slants.

Completed test: Colonies which formed green metallic sheen on eosin methylene blue agar, were sub cultured into tubes containing lactose broth and incubated at 37°C for 24 hrs after which the tubes were observed for gas production

Identification and Characterization of Microbial Isolates

The isolated bacteria were identified by using their cultural and morphological characteristics on media. This was followed by microscopic examination of the bacterial isolates under the microscope. The cultural characteristics examined included shape elevation, surface edge and consistency. Different biochemical tests were carried out to confirm their identification. Fungal isolates were identified macroscopically and microscopically

Statistical analysis

The data obtained were analyzed using the SPSS (Statistical Package for the Social Sciences) software, version 14. Student's t-test was used for comparing the relationships between the variables. Statistical significance was set at $P<0.05$

3. RESULTS

The result obtained from the investigation revealed that mean aerobic plate counts ranged from 1.0 x 10^2 cfu/g to 5.2 x 10^5 cfu/g as shown in Table 1.

Species of microorganisms isolated in different food samples were *Escherichia coli, Bacillus cereus, Salmonella* spp., *Clostridium perfringens, Shigella* spp., *Klebsiella* spp., *Proteus* spp., *Staphylococcus aureus, Campylobacter* spp., *Aspergillus* spp. and *Mucor* spp as shown in Table 2.

Table 1: Mean total aerobic microbial count (cfu/g and sfu/g) of different food samples

Food samples	TSC	TCC	TSSC	TABC	TFC
Rice	3.0 ± 0.5 x 10^3	4.5 ± 0.2 x 10^3	1.0 ± 0.1 x 10^2	4.1 ± 1.2 x 10^5	2.3 ± 0.2 X 10^3
Moin moin	4.1 ± 0.2 x 10^3	3.1 ± 1.4 x 10^3	2.0 ± 0.2 x 10^1	5.2 ± 0.5 x 10^5	1.2 ± 2.9 x10^3
Soup	3.7 ± 2.1 x 10^3	4.9 ± 0.3 x10^3	1.1 ± 0.1 x10^1	4.4 ± 0.2 x 10^4	2.4 ± 0.8 x 10^3
Beans	4.3 ± 2.1 x 10^3	3.5 ± 1.3 x 10^3	1.4 ± 0.1 x 10^2	4.9 ± 0.4 x 10^5	1.6 ± 0.4 x 10^3

Key: TSC = Total staphylococcal count, TCC = Total coliform count, TSSC = Total Salmonella Shigella count, TABC= Total aerobic bacterial count, TFC= Total fungal count

Table 2: Microbial isolates from food samples

Food samples	Microorganisms isolated
Rice	*Eschericia coli, Staphylococcus aureus, Bacillus cereus, Salmonella* spp, *Aspergillus flavus and Mucor* spp, *Klebsiella pneumoniae*
Moin moin	*Staphylococcus aureus, Eschericia coli, Proteus* spp, *Rhizopus Stolonifer. Mucor* spp, *Aspergillus* spp, *Klebsiella pneumonia*
Soup	*Eschericia coli, Staphylococcus aureus, Bacillus cereus, Salmonella* spp, *Shigella* spp, *Mucor* spp, *Aspergillus* spp
Beans	*Samonella* spp, *Staphylococcus aureus, Bacillus cereus, Klebsiella pneumonia, Escherichia coli, Aspergillus flavus, Mucor mucedo*

4. DISCUSSION

The food we consume are not often sterile, they contain different microorganisms whose composition depends upon which organisms gain access and how they grow, survive and interact in the food over time (Adams and Moss, 2005). In this investigation, the total bacterial count for the food samples ranged from nil to 7.6 x 10^4 cfu/ml. While the mean fungal counts ranged from 1.0 x 10^2 sfu/ml to 3.3 x 10^4 sfu/ml. Based on the International Commission on Microbiological Specifications for Food (ICMSF), the level of contamination of the ready-to-eat foods analyzed was within the acceptable and tolerable microbiological limit except for soups and beans which exceeded the stipulated counts. This may occur due to unhygienic practices during the preparation of foods.

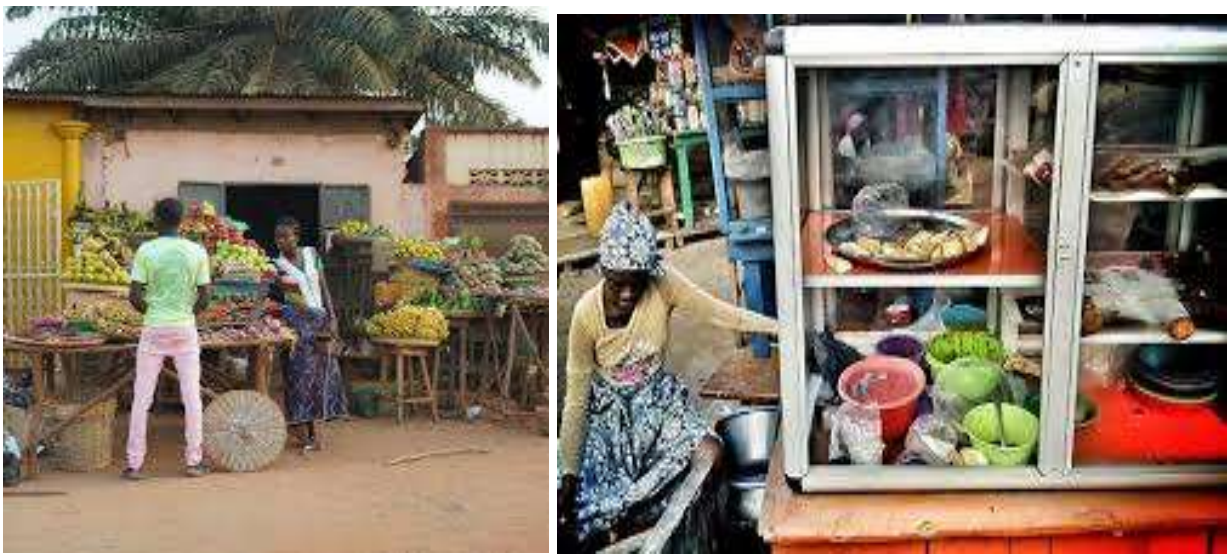

Fig 1: Food Vendors

The isolated microorganisms from food samples were *Escherichia coli, Staphylococcus aureus, Bacillus cereus, Shigella* spp, *Salmonella* spp, *Klebsiella pneumoniae, Bacillus cereus, Aspergillus flavus, Mucor mucedo, and Rhizopus stolonifer* . This agrees with the findings of Feglo and Sakyi (2012) who isolated *Klebsiella pneumonia, Staphylococcus aureus* and *Escherichia coli* from jollof rice samples in Kumasi Ghana. This also collaborate the finding of Nyenje *et al.* (2012) who isolated *B. cereus, E. coli, Klebsiella, S. aureus and Micrococcus* from the different rice dishes analyzed. Mensah *et al.* (2002) isolated *E. coli, K. pneumonia* with other bacteria from rice. Wogu *et al.* (2011) isolated *B. cereus, S. aureus, E. coli and K. pneumoniae* from ready-to-eat rice sold in Benin City, Nigeria. They also recorded high incidence of 37.5% for *B. cereus*. Oladipo and Adejumobi (2010) isolated *B. cereus* and *P. mirabilis* from rice and stew. Nyenje *et al.* (2012) isolated *Enterobacter, P. mirabilis, K. oxytoca, S. aureus, A. hydrophila* and *P. luteola* from rice in South Africa. The presence of *Staphylococcus aureus* in foods, can result into food intoxication when such food is consumed (Ghosh *et al.,* 2004).

The implication of these bacteria in food could be as a result of contaminated staffs' hands or dishes. The presence of *Bacillus cereus* in food poisoning is not often reported, as both types of illnesses because it is relatively mild and does not last more than 24 hrs. On a few occasions, illnesses have become severe leading to hospitalization and/or even death (Dierick *et al.,* 2005). The unique properties of *B. cereus* like heat resistant, endospore forming ability, toxin production and psychotropic nature gives ample scope for this organism to be a prime cause of public health hazard (Umoh and Odam, 2009). Studies have shown that *Aspergillus* species produce aflatoxins of which have been implicated with some diseases in livestocks and humans throughout the world. The main producer of a well-known carcinogenic aflatoxins is *Aspergillus niger* and its presence in food is of main concern in terms of food safety, they are lethal at minute amount (Rodriques *et al.,* 2007).

The result of this research has showed the extent of bacterial and fungal contamination of food sample. The presence of these microorganisms in food beyond tolerable level can cause food infection. Food should not only be nutritional balanced but should be microbiologically safe as well.

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