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Bacteriological Status of Commonly Consumed Food in Osun State Polytechnic Iree

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Abstract
A total of 25 different campus foods samples were purchased randomly from four different vendors in Osun State Polytechnic, Iree, Nigeria. The samples were brought in ice to the laboratory for bacteriological analysis. Pour plate technique was used .Serial dilutions of the samples were used after one ml from each tube was pipetted into a nutrient agar plates and incubated aerobically and anaerobically for 24 hours at 37^0C. The plates were examined for growth. Sub-culturing of colonies from the growth was done on bacteriological agar. All screened samples had levels of bacterial growth ranging from $1.11 \times 10^3 – 6.1 \times 10^3$CFU/ml. Staphylococcus aureus, Staphylococcus epidermidis, Staphylococcus saprophyticus and Rhizopus were isolated and identified from the food samples.

Keywords: *Vendors, Bacteriological Analysis, Serial Dilution, Iree.*

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I. Introduction

Human food is any substance that is consumed to maintain life and growth of the body (Ezeronye, 2007). Bacterial food spoilage is any sensory change (tactile, visual, olfactory or flavor) which makes the food to be unacceptable for consumption. Spoilage may occur if there is improper handling, cooking, cooling, unhygienic utensils, and unnecessary time lag between preparation and consumption (FDA, 2004, Munide and Kurai, 2005).

In Nigeria, the unhygienic handling of foodstuff, health status of food vendors, poor sanitary conditions of markets, absence of adequate waste disposal facilities, use of contaminated water and kitchen equipment and poor storage affect food safety (WHO, 2001).

In Nigeria, selling of street foods in markets is common but most consumers and vendors have little or no knowledge about food safety. Consumption of street food has grown over the years due to rapid population growth, unemployment, poverty and availability of relatively low cost foods (Martins, 2006).

Symptoms of food borne illnesses include: diarrhoea, vomiting, abdominal cramp and nausea (Nweze, 2010); most of which are caused by *Staphylococcus spp Rhizopus, Salmonella spp, Clostridium perfringens, Clostridium botulinum, Campylobacter, Vibrio parahaemolyticus, Bacillus cereus and* Entropathogenic *Escherichia coli.* Food safety depends on conditions necessary during the production, processing, storage, and preparation of food to ensure that it is safe, sound, wholesome, and fit for human consumption (FAO/WHO, 1990).

Food may become difficult to obtain in an emergency or following a disaster. Crops may be destroyed in the fields, animals may be drowned, food supply lines may become disrupted, and people may be forced to flee to areas where they have no access to food (WHO, 2001). Moreover, the safety of whatever food there is may be affected, resulting in a greater risk of epidemics of foodborne disease. Food safety problems vary in nature, severity and extent, and depend on the situation during the emergency or disaster. For example, during floods and hurricanes, food may become contaminated by surface water that has itself been contaminated by sewage and wastewaters. Flood waters often pick up large quantities of wastes and pathogenic bacteria from farms, sewer systems, latrines and septic tanks.

Spoilage is manifested by a variety of sensory cues such as off-colors, off-odors, softening of vegetables and fruits, and slime. However, even before it becomes obvious, microbes have begun the process of breaking down food molecules for their own metabolic needs. Sugars and easily digested carbohydrates are used first, plant pectins are degraded. Then proteins are attacked, producing volatile compounds with characteristic smells such as ammonia, amines, and sulfides. These odors start to develop in meat when there are about 10^7 cfu of bacteria/cm^2 of meat surface and are usually recognizable at populations of 10^8 cfu/cm^2. Early detection of spoilage would be advantageous in reducing food loss because there may be interventions that could halt or delay deterioration, and on the other hand food that had reached the end of its designated shelf life but was not spoiled could still be used. Numerous methods for detection of spoilage have been devised with the goals of determining concentrations of spoilage microbes or volatile compounds produced by these microbes. However, many of these methods are considered inadequate because they are time-consuming, labor-intensive, and/or do not reliably give consistent results (Kamil, 2005).

This work investigates selected foods and vegetables sold by vendors in Osun State Polytechnic, Iree, Nigeria for bacterial contamination. Isolated and identified bacterial species associated with food contamination and their microbial loads were determined. The public health implications of consumption of such foods were established (Gaze, 2007).

II. Materials and Methods

A bacteriological examination was conducted in different food vending site at Osun State Polytechnic Iree Main Campus.

Sample Collection: Four samples each of white rice (Oryza sativa), Semovita, Fufu (Analog flour) and Amala (Yam flour) were purchased from various bukateria in Osun State Polytechnic Iree main campus and studied to determine their level of bacterial contamination and safety for human consumption.

Sample Preparation: Food samples were transferred into sterile polythene bags on ice to the laboratory. 10g portion of each food sample was homogenized and serial dilution made and examined using pour plate method.

Culturing of Sample (Pour Plate): One millimeter of each dilution (10`1-10`12) were pippetted into nutrient agar plates, plates were incubated aerobically anaerobically at 37°c for 24 hours. Sub-culturing was made in fresh nutrient agar plate which was incubated aerobically and anaerobically at 37°c for 24 hours. Identification of isolates obtained in the culture were carried out using colonial morphology, Gram's staining (Nester *et al.*, 2007).

III. Results

Table 1: Colonial Morphology of Bacteria Isolated from Different Food Samples

MEDIUM	SAMPLES	MORPHOLOGY OF BACTERIA COLONIES
N.A (Nutrient Agar)	SEMOVITA	Yellow colour pigment, with rough surface, butter like in consistency, opaque in opacity, entire/undulate colony, convex in elevation and circular in shape (Cocci).
N.A (Nutrient Agar)	FUFU (Analog flour)	Whitish pigment, with rough surface, butter like in consistency, transparent in opacity, entire colony, convex in elevation and circular in shape (Cocci).
M.A (Malt Agar)	RICE (Oryza sativa)	Yellowish pigment, with wrinkle colony surface, granular in consistency opaque in opacity, rhizoid colony and rhizoid shaped (root like).
N.A (Nutrient Agar)	AMALA (Yam flour)	Cream colour pigment, with smooth & glistening colony surface, granular in consistency, opaque in opacity, entire colony, convex and circular bacterium (Cocci)

Table 1 shows colonial morphology of bacteria isolated from the food samples. Where organism with yellow colour pigment, rough surface, butter like consistency, opaque in opacity, entire/undulate colony, convex elevation and circular shaped was obtained from SEMOVITA.

And in second column where organism with whitish pigment ,rough surface ,butter like consistency, transparent opacity, entire colony, convex in elevation and circular shaped was obtained from fufu (Analog flour).

In respect to the third column of the table, the organism with yellow pigment, wrinkle colony surface, granular consistency, opaque in opacity, rhizoid colony, and rhizoid shaped was obtained from RICE (Oryza sativa).

And the last column of the table (1), in which organism with yellow pigment, smooth & glistening colony surface, granular consistency, opaque in opacity, entire colony, convex and circular bacterium was obtained from AMALA (Yam flour).

Table 2: Total Bacteria Count (Cfu/ml) of Food Prepared in Osun State Polytechnic Iree Main Campus

FOOD SAMPLES	NO OF COLONY	DILUTION	BACTERIA COUNTS
SEMOVITA	111	10^1	1.11×10^3
RICE (Oryza sativa)	130	10^3	1.3×10^5
FUFU (Analog flour)	186	10^1	1.86×10^3
AMALA (Yam flour)	61	10^3	6.1×10^3

Table 2 indicates colony formed per ml of each sample on the plates. However 1.11×10^3 CFU was obtained from 10`1 dilution factor of Semovita.

Second column indicates that 1.3×10^5 CFU was obtained from 10^3 dilution made factor of Rice.
Moreover the third column of the table (2) shows that 1.86×10^3 CFU was obtained from 10^1 dilution factor of Fufu.
And also the last column of the table indicates that 6.1×10^4 CFU was obtained from 10^3 dilution factor of Amala.

Table 3: Isolated Bacteria from Food Samples

FOOD SAMPLES	ISOLATED BACTERIA
SEMOVITA	*Staphylococcus aureus*
FUFU(analog flour)	*Staphylococcus epidermidis*
RICE (Oryza sativa)	*Rhizopus*
AMALA(Yam flour)	*Staphylococcus saprophyticus.*

Table 3: Identifies organisms isolated from the food samples. Staphylococcus aureus, Staphylococcus epidermidis and Staphylococcus saprophyticus were isolated from semotiva, fufu and amala while Rhizopus was obtained from rice.

IV. Discussion

A total of 25 campus food samples were examined for bacteria contaminations.

Result shows that all the campus food samples were contaminated with various level of bacteria counts. The results obtained are shown in tables 1-3. The isolation of bacteria in all the food samples from different vendors in Osun State polytechnic Iree main campus is indicative.

The high frequency of isolation and bacteria loads indicate fecal-oral transmission. The isolation of staphylococcus species from semovita, fufu (Analog flour), and Amala and isolation of *Rhizopus* from rice may be due to unhygienic and poor environment condition that prevails in the sampling area as well as poor personal hygienic condition of the vendors. Rhizopus detection in rice account for use of manure from poultry farms as reported by (Ohanu and Ogeneh, 2014).

The high level of prevalence of *Staphylococcus* infections can be drastically reduced by proper maintenance of where raw materials of the food was processed, especially in the case of Amala (yam flour), Semovita and Fufu (Analog flour). At the same time the level of *Rhizopus* can be diminished through washing of the rice properly prior to the cooking (FDA, 2004).

The high total bacteria count of $>10^4$ CFU/ml of screened food samples especially in Amala (yam flour) implies extreme contamination and poses potential health risks. This vital incidence was mainly owing to the largely improper hygienic status of the food preparations and processing areas. Majority of the campus food centers are located beside dusty roads (Oghene *et al*., 2014). Moreover unavailability of running water, sewage disposal infrastructure, inappropriate storage conditions and the presentation of these foods openly, enhanced enormous contaminations.

Result also shows that rice has high proportion of material contamination than the three swallows (Table 2), this may be due to the lack of correct food handling rules; in order to avoid this, always wash hands with soap and warm water, wet the hands before applying the soap. Make sure you rub in between fingers and on the front and backs of hands. All these rules are necessary before deeping hands into the bowl of rice for washing. And also make sure that foods of different process are not stored together to avoid cross contamination.

When *Staphylococcus aureus* is present in food; it can produce a toxin that causes illness. Although cooking destroy *Staphylococcus aureus*; yet the toxin it produces is heat stable. Proper personal hygienic measures when handling foods will keep *Staphylococcus aureus* from food and also refrigeration of raw and cooked foods will prevent the growth of these bacteria as reported by (Wagner, 2001). *Staphylococcus* species isolated from Semovita, Fufu and Amala is a pointer to largely poor personal hygiene, improper storage facilities, use of low quality raw materials and unhygienic selling habit. These factors contribute to the proliferation of the bacteria and consequently, the high level of microbial counts recorded in the research work.

Similarly, *Staphylococcus epidermidis* isolated from the samples accounts for toxins production that can result to illness and its isolation is also a pointer to largely poor personal hygiene, use of low quality raw materials and unhygienic sales.

TABLE 1: These factors contribute to the proliferation of the bacteria and high level of microbial count recorded as agreed by (Oghene *et al*., 2014) who isolated *Staphylococcus aureus* from jollof rice and water leaf.

V. Conclusion

Most food spoilage accidents results due to mishandling food keeping it at the wrong temperature, incorrect re-handling cross contamination. The major type of pathogenic bacteria associated with foods are *Salmonella*, *Clostridium Perfringes*, *Staphylococcus aureus*, *Listeria monocytogens*, *Camphylobacter jejuni*, *Bacillus cereus* and *Escherichia coli*. *Escherichia coli* is a member of the family *Enterobacteriaceae* (Ewing *et al*., 1986), which consist of many genera, such as *Shigella*, *Salmonella* and *Yersinia*. Most strains of *E. coli* are not regarded as pathogens that cause infections.

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