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Full Length Research Paper

Pathogenic microbes Confinement from a few sustenance sold at selected private schools in Akoka region of Yaba – Lagos, Nigeria

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A total of sixty-four samples of four cooked foods from sixteen private primary schools in Akoka area of Yaba, Lagos, Nigeria were investigated for the occurrence of pathogenic bacteria. The area was divided into four zones, namely; Akoka north, Akoka south, Akoka east and Akoka west, using the four cardinal points. Four private primary schools were then selected from each of these zones. The standard plate count revealed that for Akoka North, the summary of the average microbial load for the rice, beans, meat and spaghetti samples are 3.5×10^4 CFU/ml, 6.9×10^4 CFU/ml, 4.9×10^4 CFU/ml, and 2.4×10^4 CFU/ml respectively; while the microbial load for similar sample in Akoka south are 2.9×10^4 CFU/ml, 6.8×10^4 CFU/ml, 4.9×10^4 CFU/ml and 2.4×10^4 CFU/ml respectively; whereas in Akoka East it is 3.3×10^4 CFU/ml, 4.6×10^4 CFU/ml, 4.6×10^4 CFU/ml and 2.5×10^4 CFU/ml; and in Akoka West, it is 2.9×10^4 CFU/ml, 4.7×10^4 CFU/ml, 4.9×10^4 CFU/ml and 2.2×10^4 CFU/ml. Further examination of the isolates revealed the presence of rod and cocci shaped bacteria. Some of these isolates were identified as *Escherichia coli, Staphylococcus aureus*, Pseudomonas spp. and *Bacillus cereus* and these are possible pathogens.

Key word: Food samples, isolates, pathogens, primary schools, Akoka area, microbial load.

INTRODUCTION

Food borne illness is an ever-present threat that can be prevented with proper care and handling of food products. It is estimated that between 24 and 81 million cases of food borne diarrhea disease that occur each year in the United States, a cost of between 5 and $17 billion in medical care is lost in productivity (MacPherson and Tonkin, 2004).

Bacteria food poisoning is the most common type of food poisoning and it is caused as a result of the presence of harmful bacteria or poisonous substances produced by them in food. An outbreak of food poisoning may be caused by food which appears to be quite quite different from those involved in food spoilage. Harmful bacteria (pathogens) find their way into food in number of ways. However most food poisoning occurs as wholesome in spite of the fact that it is heavily infected by microorganism. The organism causing food poisoning are a result of unhygienic behaviour and inappropriate handling practices by humans (Adams and Moss, 2003). Pathogens can be carried and passed on to others by individuals who themselves are not ill. Such carriers may have recently suffered an attack of food poisoning and still be harbouring the organisms in their body. In some cases carriers of food poisoning act as host over a period of many years having themselves acquired immunity to organisms concerned e.g. *Salmonella typhi, Bacillus cereus*. Most often they are unaware of their role as a reservoir of infection (Janet and Adel, 2006; Nichol and Salek, 2007).

High risks foods are foods that are likely to be infected with pathogens and foods intended to be eaten without cooking, examples include: meat, cooked rice, fish, eggs,

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Table 1. Results of plate count for schools in Akoka South.

Food sample	Number of colonies	Dilution factors	Volume of inoculums (ml)	Total number of organisms (CFU/ml)
A. School 1				
Rice	30	10^{4}	0.1	3.0×10^{4}
Beans	92	10^{4}	0.1	9.2×10^{4}
Spaghetti	22	10^{4}	0.1	2.2×10^{4}
Meat	47	10^{4}	0.1	4.7×10^{4}
B. School 2				
Rice	27	10^{4}	0.1	2.7×10^{4}
Beans	59	10^{4}	0.1	5.9×10^{4}
Spaghetti	19	10^{4}	0.1	1.9×10^{4}
Meat	58	10^{4}	0.1	5.8×10^{4}
C. School 3				
Rice	29	10^{4}	0.1	2.9×10^{4}
Beans	80	10^{4}	0.1	8.0×10^{4}
Spaghetti	20	10^{4}	0.1	2.0×10^{4}
Meat	68	10^{4}	0.1	6.8×10^{4}
D. School 4				
Rice	32	10^{4}	0.1	3.2×10^{4}
Beans	42	10^{4}	0.1	4.2×10^{4}
Spaghetti	36	10^{4}	0.1	3.6×10^{4}
Meat	51	10^{4}	0.1	5.1×10^{4}

poultry, milk e.t.c. Some bacteria produced toxins called endotoxin while others produced exotoxins. The main type of pathogenic bacteria associated with foods is: Salmonella, *Clostridium perfringes*, *Staphylococcus aureus*, *Listeria monocytogenes*, *Campylobacter jejuni*, *Clostridium botilinum*, *B. cereus*, and *Escherichia coli*.

The work is aimed at isolating pathogenic bacteria present in foods sold in selected private schools in Akoka area of Yaba local government, Lagos state and to show the level of prevalence of pathogenic bacteria in the foods.

MATERIALS AND METHODS

Sample collection

Akoka area of Yaba local government was divided into four zones using the cardinal points. The zones are: Akoka north, Akoka south, Akoka east, Akoka west. Cooked food like rice, beans, boiled beef, and spaghetti, were purchased from four randomly selected private primary schools in each of these zones. The samples were collected at break time when pupils have their meals. The samples were collected in a sterile plastic container (coded with appropriate letters and numbers) and transported to the laboratory and analyzed within an hour of collection.

Isolation of organisms

The samples were inoculated in the McConkey agar and Nutrient agar media as base media prior to isolation. The isolation of the organisms was done after 24 h of incubation at 37°C. To achieve purity, isolate were randomly picked using a sterile wire loop and re-inoculated on fresh sterile McConkey agar and Nutrient agar plate which were incubated for 24 h at 37°C.

Microbiological analysis

Suspected isolates were picked and identified on the bases of colonial, morphological and biochemical characteristics (Sneath et al., 1986; Claus, 1992; Harrigan and McCance, 1982).

RESULTS AND DISCUSSION

The study was conducted to examine the occurrence of pathogenic bacteria in foods sold in schools within the marked area.

The plate count result obtained from the samples shows that beans (6.9×10^{4} CFU/ml) contains the highest amount of bacteria followed by meat, (4.9×10^{4} CFU/ml), rice (3.5×10^{4} CFU/ml) and spaghetti (2.4×10^{4} CFU/ml) (Table 5). The international standards for microorganisms in foods recommended a limit of bacterial count of less than 10^{5} CFU/ml (Owhe- Ureghe et al., 1993; Rose and Osunnaiye, 2003). Thus the results of the plate count indicate that the foods have high microbial counts (Tables 1-4).

Biochemical tests performed on the Gram positive

Table 2. Results of plate count for schools in Akoka North.

Food sample	Number of colonies	Dilution factors	Volume of inoculums (ml)	Total number of organisms (CFU/ml)
A. School 1				
Rice	36	10^4	0.1	3.6×10^4
Beans	53	10^4	0.1	5.3×10^4
Meat	50	10^4	0.1	5.0×10^4
Spaghetti	24	10^4	0.1	2.4×10^4
B. School 2				
Rice	28	10^4	0.1	2.8×10^4
Beans	66	10^4	0.1	6.6×10^4
Meat	67	10^4	0.1	6.7×10^4
Spaghetti	17	10^4	0.1	1.7×10^4
C. School 3				
Rice	33	10^4	0.1	3.3×10^4
Beans	80	10^4	0.1	8×10^4
Meat	25	10^4	0.1	2.5×10^4
Spaghetti	25	10^4	0.1	2.5×10^4
C. School 4				
Rice	44	10^4	0.1	4.4×10^4
Beans	79	10^4	0.1	7.9×10^4
Meat	55	10^4	0.1	5.5×10^4
Spaghetti	30	10^4	0.1	3.0×10^4

Table 3. Results of plate count for schools in Akoka East.

Food sample	Number of colonies	Dilution factors	Volume of inoculums (ml)	Total number of organisms (CFU/ml)
A. School 1				
Rice	36	10^4	0.1	3.6×10^4
Beans	42	10^4	0.1	4.2×10^4
Meat	23	10^4	0.1	2.3×10^4
Spaghetti	12	10^4	0.1	1.2×10^4
B. School 2				
Rice	32	10^4	0.1	3.2×10^4
Beans	51	10^4	0.1	5.1×10^4
Meat	50	10^4	0.1	5.0×10^4
Spaghetti	38	10^4	0.1	3.8×10^4
C. School 3				
Rice	39	10^4	0.1	3.9×10^4
Beans	48	10^4	0.1	4.8×10^4
Meat	63	10^4	0.1	6.3×10^4
Spaghetti	30	10^4	0.1	3.0×10^4
C. School 4				
Rice	28	10^4	0.1	2.8×10^4
Beans	43	10^4	0.1	4.3×10^4
Meat	49	10^4	0.1	4.9×10^4
Spaghetti	18	10^4	0.1	1.8×10^4

Table 4. Results of plate count for schools in Akoka West.

Food sample	Number of colonies	Dilution factors	Volume of inoculums (ml)	Total number of organisms (CFU/ml)
A. School 1				
Rice	37	10^{4}	0.1	3.7×10^{4}
Beans	44	10^{4}	0.1	4.4×10^{4}
Spaghetti	30	10^{4}	0.1	3.0×10^{4}
Meat	23	10^{4}	0.1	2.3×10^{4}
B. School 2				
Rice	23	10^{4}	0.1	2.3×10^{4}
Beans	44	10^{4}	0.1	4.4×10^{4}
Spaghetti	51	10^{4}	0.	5.1×10^{4}
Meat	17	10^{4}	0.1	1.7×10^{4}
C. School 3				
Rice	25	10^{4}	0.1	2.5×10^{4}
Beans	55	10^{4}	0.1	5.5×10^{4}
Spaghetti	54	10^{4}	0.1	5.4×10^{4}
Meat	22	10^{4}	0.1	2.2×10^{4}
D. School 4				
Rice	34	10^{4}	0.1	3.4×10^{4}
Beans	47	10^{4}	0.1	4.7×10^{4}
Spaghetti	62	10^{4}	0.1	6.2×10^{4}
Meat	26	10^{4}	0.1	2.6×10^{4}

Table 5. Results of the average total number of organisms for the four zones and summary of pathogenic isolates.

Food sample	Akoka North (CFU/g)	Akoka South (CFU/g)	Akoka East (CFU/g)	Akoka West (CFU/g)	Summary of Pathogenic organisms isolated
Rice	3.5×10^{4}	2.9×10^{4}	3.3×10^{4}	2.9×10^{4}	*S. aureus*
Beans	6.9×10^{4}	6.8×10^{4}	4.6×10^{4}	4.7×10^{4}	*B. cereus*
Meat	4.9×10^{4}	4.9×10^{4}	4.6×10^{4}	4.9×10^{4}	*E. coli*
Spaghetti	2.4×10^{4}	2.4×10^{4}	2.5×10^{4}	2.2×10^{4}	*Pseudomonas* spp

isolates revealed that out of the 7 Gram positive isolates 4 are *S. aureus* and the remaining are *B. cereus*. The result also reveals that among the Gram negative isolates, 7 out of the 9 are *E. coli* while the rest are *Pseudomonas* spp. (Harrigan and McCance, 1982).

Furthermore, it shows that it is possible for cooked foods to be contaminated with pathogenic bacteria. This implies that attention should be given to sanitary behavior of food handlers. These pathogenic organisms release toxins, which are the agents responsible for illnesses such as diarrhea, dysentery, nausea and vomiting, caused by these organisms upon consumption of the contaminated foods (Costa and Pirovani, 2007). The ingestion of a small number of some pathogens may be sufficient to cause illness, whereas a much larger number might be required to produce the same effect if a different organism were involved. Unfortunately, even quite small numbers of microbes can grow quickly into dangerous hordes when foods are not properly stored. However, the acidic nature of the stomach and the body's natural defensive mechanisms are often able to deal with food which is not too heavily infected and so it is sometimes possible to eat food contaminated with pathogenic bacteria without becoming ill.

The findings of this study have confirmed that pathogenic bacteria can exist in cooked foods even though they may physically appear to be quite wholesome; thus, proper steps should be taken to ensure that the occurrence of such organisms in foods is kept within limits.

Conclusion

It can be concluded that pathogenic bacteria capable of causing food poisoning can be isolated from cooked foods using microbial analysis. Also such bacteria can be identified using appropriate biochemical tests and the total microbial load of such foods can as well be ascertained thereby providing information on their microbial quality.

RECOMMENDATION

It is hereby recommended that routine microbial analysis of foods sold at public places be carried out to prevent outbreak of food poisoning. Also appropriate handling and hygienic practices should be ensured by food vendors in primary schools. Furthermore, food handlers should be educated on appropriate storage temperature for cooked foods. This kind of study should also be conducted in other areas of Yaba Local Government, Lagos, Nigeria so as to provide a comprehensive data for the local government public health section.

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