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Estimation of Bacterial load of Fried Rice Prepared in Five Different Restaurants in Abraka, Delta State Nigeria

JEMIKALAJAH, DJ

Department of Science Laboratory Technology, Delta State University, Abraka, Delta State Nigeria
Email: jemikalajah2007@yahoo.com

ABSTRACT: Evaluation of bacteria in prepared fried rice is essential in food quality assessment. This study aimed at evaluating the bacterial load of fried rice prepared in five (5) different restaurants in Abraka, Delta State Nigeria from January, 2018 to June, 2018. Samples of fried rice were randomly obtained from the restaurants and labelled R1, R2, R3, R4 and R5. A standard bacteriological culture technique was used for bacterial isolation. Serial dilution and bacterial viable count of cell/colony was done using agar plate count. The mean value of colony counts of bacteria isolates were $2.1 \times 10^4 \pm 18.50$, $2.4 \times 10^4 \pm 19.00$, $2.9 \times 10^4 \pm 27.62$, $3.0 \times 10^4 \pm 21.83$ and $3.6 \times 10^4 \pm 30.67$ in ascending order for R5, R3, R2, R4 and R1 respectively. The highest bacteria count was obtained from R1 and the lowest from R5.The bacteria isolates identified were *Escherichia coli*, *Staphylococcus aureus* and *Streptococcus spp.* The present study suggests that preparation of fried rice under hygienic conditions, identifying carriers and freezing will reduce the risk of contamination.

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Rice is one of the most important staple foods for human population worldwide, especially in Africa and the West Indies (Boyce *et al.,* 2016). In Africa, rice has been used to improve nutrition quality, boost food security, foster rural development and support sustainable healthcare (Chomvarin et al*.,* 2016). The nutritional value of rice is provided by its contents in carbohydrate, sugar, fibre, energy, fat, protein, water, iron, calcium, magnesium and zinc (Kaneko *et al.,* 2009). Fried rice is a leading cause of *Bacillus cereus* food poisoning which is frequently present in uncooked rice, and the heat resistant spores may survive cooking (Rotkind, 2008).Despite the many advantages of restaurant food, there are also numerous health problems that are involved in this sector of the economy. Multiple lines of evidence indicate that fried rice exposed on sale in restaurants may become infected by bacteria (Bryan *et al.,* 2012). Evidently, restaurant fried rice have shown epidemiological links with illness and has raised concern in respect to their potential for serious food poisoning outbreaks (Davis and Samuel, 2007). Improper storage, poor unsanitary environment and dirty utensils may lead to contamination of raw and cooked rice (Davis and Samuel, 2007). Source of contamination varies, and it may occur during fried rice preparation in an unhygienic environment, contamination from dirty hands, filthy cooking utensils and unclean cooking water. Fried rice left out for more than 1 to 2 hours at room temperature enhances rapid bacteria multiplication. Most bacteria grow undetected, since there is no production of an "off" odour or change in the colour or texture of the fried rice (Chen, 2011).Various bacteria such as *Staphylococcus aureus, Escherichia coli* and *Salmonella sp.,* remain viable on the hands and surfaces for hours or days after initial encounter (Kusumaningrum *et al.,* 2012). These bacteria are responsible for most food-borne illness and the cause of bacterial food poisoning or death to many people at unquantifiable economic cost and human suffering (Borch and Arinder, 2002).Contamination of fried rice with bacteria is an emerging problem associated with restaurant with low hygienic practice in Nigeria, especially in areas where proper hygiene practice is not well establish. Several diseases can result from the consumption of contaminated fried rice such as; diarrhoea, cholera, and dysentery and when left untreated may lead to death. Therefore, this study is set to evaluate the bacterial load of fried rice prepared in different restaurants in Abraka, Delta State Nigeria.

MATERIALS AND METHODS

Study area: Abraka, is among the 25 Urhobo kingdom in Delta State, Nigeria. It is mostly known as a University town and a favourite destination for tourists. The Abraka beach is well known for its

outdoor activities like, fishing, swimming and others. As a result of these activities, fried rice becomes a favourite dish for the inhabitants and visitors. Abraka town has an estimated population of about 276,700 (World Gazetteer, 2007).

Study/Experimental design: Five different restaurants in Abraka town were enrolled for the study after verbal consent was obtained from proprietors of the restaurants. The restaurants were labelled; RI, R2, R3, R4 and R5.

Collection of samples: Samples of the fried rice were obtained from the different restaurants in sterile universal containers. Samples of fried rice from the respective locations were collected and kept in sterile universal containers. The samples were transferred to Analytical/Research Laboratory of the department of Science Laboratory Technology, Delta State University, Abraka and were analysed immediately.

Preparation of media: All media used (nutrient agar, MacConkey agar, blood agar) were weighed appropriately and prepared according to manufacturer's instruction. They were autoclaved at 121°C for 15min and allowed to cool before use (Cheesbrough, 2000).

Homogenization of fried rice: Sample of rice (3g) was dissolved in 100mls of water, homogenized and labelled A. One millilitre (1ml) of the suspension was removed with sterile pipette and transfer in to 9ml of water blank. It was mixed thoroughly and labelled B. This dilution was repeated three times, each time with 1ml transferred from previous suspension into 9ml water blank labelled sequentially as tubes C, D and E. These result in serial dilutions of 0.1, 0.01 and 0.001, rice /ml.

Spread plate bacterial culture: To grow bacterial colonies, 3 prepared nutrient agar plates were labelled C1, D2 and E3. 0.1ml of mixed samples C, D and E was transferred onto each plate labelled C1, D2 and E3 respectively. This increases the dilution values further by factors of 10 and the medium was then incubated at 37°C for 24 hours. The colony count was reported as colony forming units per gram of rice sample (cfu/g) (Elliott *et al.,* 1978)

Isolation of bacteria: Serial dilution was carried out in five sterile test tubes with 9ml of distilled water. One ml of the homogenized fried rice samples was introduced into the first tube containing distilled water and was allowed to mix properly. One millilitre (1ml) was withdrawn from the first test tube using a sterile pipette and was transferred into the second test tube. This process was repeated for the remaining test tubes. An aliquot of 0.1ml was withdrawn using a sterile pipette from test tubes 3 and 5 (0.001and 0.00001) and was inoculated into the sterile petri dishes containing already prepared agar (nutrient agar, blood agar and McConkey agar). The culture plates were incubated at 37°C for 24 hours. After incubation, colonies were picked up with wire loop and were sub-cultured into petri dishes containing freshly prepared nutrient agar.

Identification of bacterial isolates: After incubation, bacteria were identified based on the cultural, morphological and reaction to biochemical test (Cheesbrough, 2000; Cowan, and Steel, 1974; Cruikshank *et al.,* 1975).

RESULTSAND DISCUSSION

Fried rice can easily be contaminated with pathogenic bacteria during preparation and handling because it is nutritious. The present work indicates that fried rice sold in different restaurants in Abraka, are contaminated. The mean value of colony counts of bacteria isolates in ascending order were R5 2.1 x 10^4 ±18.50, R3 2.4 x 10^4 ±19.00, R2 2.9 x 10^4 ± 27.62, R4 3.0 x 10^4 ± 21.83 and R1 3.6 x 10^4 ± 30. 67. The highest bacteria counts was obtained from R1 and the lowest R5 (Table 1). Bryan *et al*., (2012) in their report stated that fried rice exposed for sales at restaurants may become contaminated by pathogenic bacteria. The findings of high bacterial colony counts in the present work may be attributed to various sources of contamination which may occur during fried rice preparation, or when cooked and allowed to remain at more than two hours at room temperature where bacterial can multiply quickly. Although, Chen (2011) opined that most bacterial growth are undetected since there is no production of an off odour or change texture of the fried rice but freezing fried rice slows or stops multiplication and does not destroy it.

Table 1: Mean values of total bacteria colony count (cfu/g) from different restaurants.

Restaurants	Bacterial count (cfu/g)
R1	3.6 x 10^4 ± 30.67
R2	2.9 x 10^4 ± 27.62
R3	2.4 x 10^4 ± 19.00
R4	3.0 x 10^4 ± 21.83
R5	2.1 x 10^4 ± 18.50

Table 2: Identified bacterial isolates from fried rice in the differentrestaurants

Isolates	R1	R2	R3	R4	R5
Escherichia coli	+	-	-	-	-
Staphylococcus aureus	+	-	+	+	+
Streptococcus spp	-	+	+	+	-

The bacteria isolates identified were *Escherichia coli* from R1, *Staphylococcus aureus* from R1, R3 and R4 while *Streptococcus spp.* was obtained from R2, R3

and R4 (Table 2).The presence of these bacteria suggests contamination through unhygienic and unsanitary conditions of the preparation environment. Borch and Arinder (2002) have earlier stated that bacteria such as *Staphylococcus aureus, Escherichia coli* and *Salmonella sp.* have been associated with food borne illness and are the cause of bacterial food poisoning to many people at immeasurable economic cost. However,*Salmonella sp.*was not isolated in this work. For the safety of fried rice consumers, perfect hygienic conditions should be maintained at the restaurants and food handlers who are carriers should be detected and treated accordingly to reduce bacterial load. However, the presence of *Escherichia coli*, *Staphylococcus aureus and Streptococcus spp* demonstrates a potential health risk since these organisms have been indicated in food borne diseases which may be as a result of faecal contamination from the dirty hands of the food handlers.

Conclusion: The current work has revealed lack of knowledge, non-observance of rules and regulations guiding food handling among the proprietors of restaurants in Abraka. This may probably have accounted for variation in the bacteria load from collection points; therefore, there is need for good hygiene practices in the chain of fried rice preparation and processing to prevent fried rice borne illness.

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