IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 17, Issue 1 Ser. II (January 2023), PP 19-22
www.iosrjournals.org

Food Safety in Cooking Rice with Unshelled EGG

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Abstract
Background: *It is a common practice in the some parts of Nigeria to boil rice with unshelled egg in the same medium basically for the purpose of convenience and conservation of cooking gas, hence, it is imperative to evaluate health safety of this cooking method. Food safety is a process of ensuring food meant for consumption is safe, suitable and wholesome. Adherence to food safety principles during harvesting, handling, storage, purchase, preparation, holding, and serving of food is imperative. This study was carried out to evaluate the safety of consuming rice cooked with unshelled egg in the same medium.*
Materials and Methods: *Eggs were purchased from the Federal College of Agriculture poultry farm and they were cooked in the same medium with (1cup) 125g of rice for 30minutes at boiling temperature. The cooked rice was gently collected with spoon around the shell of the egg in the medium. The cooked rice collected around the shell of the egg was subjected to microbial analysis to determine the microbial load of the rice. Identification and isolation method was used to determine the specific organisms attributed to egg. Salmonella shigella agar (SSA) and Eosin Methylene blue (EMB) agar was used to isolate Salmonella spp. and Escherichia coli in the samples.*
Results: *The result showed that rice cooked with washed egg had no value or reading for Salmonella and Escherichia coli while rice cooked with unwashed egg had 1.87 x 10^4cfu/g and 1.11x10^4cfu/g of Escherichia coli and Salmonella spp. respectively.*
Conclusion: *It can be inferred that though the value of sample A may be low, but the possibility of having toxins and metabolites which may adversely affect human health. Individuals should therefore avoid cooking rice with unshelled eggs in the same medium. Further research can be carried out on the other organisms from egg.*
Keywords*: food safety, rice, hygiene, microbial, poisoning.*

Date of Submission: 05-01-2023 Date of Acceptance: 19-01-2023

I. Introduction

Food borne disease caused by micro – organisms are of public health concern [1]. Contamination of eggs and egg products with microorganism can affect egg quality, which may lead to spoilage and pathogen transmission. They may induce food borne infection or intoxication to consumers. Today, eggs consumed in pastries and stews are considered very nutritious and a good source of protein. Although, eggs are considered a complete food for growth and sustenance, a study indicated that microorganism often contaminate eggs [2]. Freshly laid eggs are generally devoid of organisms. However, following exposure to environmental conditions for example, soil, fecal materials and dirty nesting materials, eggs become contaminated with different types of microorganism [3]. Furthermore, these microorganisms may contaminate the egg contents either by penetration or withdrawal through pores of the shells and also through the transovarian route. Food safety is a scientific discipline describing handling, preparation and storage of food in ways that prevent food – borne illness. Food to be consumed should be devoid of harmful microorganisms that can cause food poisoning or food intoxication. The World Health Organization (WHO) indicated that an estimated of 2 million people die due to complications related to food borne and waterborne diarrheal disease [4].

Rice is the seed of the grass specie *Oryza sativa*. It is a staple food for over half of the world's population and the most important among all the cereal crops [5]. It has been recorded that per capita consumption of rice has increased in the past decade [6].

Epidemiological data demonstrate that food is an important factor in transmitting pathogens that cause diarrheal illness [7]. Food contamination and cross contamination is higher particularly in low socio – economic classes due to unsatisfactory environmental conditions, poor personal hygiene, poor quality and insufficient water supplies, unhygienic preparation and storage of food [8,9].

Contamination of eggs and egg product with microorganism can affect egg quality, which may lead to spoilage and pathogen transmission. This study therefore aimed at understanding the effects that could occur when cooking rice with unshelled egg.

II. Materials and Methods

Chicken eggs were purchased from Federal College of Agriculture, Ibadan poultry farm. The rice was purchased from Apata market.

Sample preparation method

A small pot with fitting lid was place on the gas top. 500ml of water was boiled. 125g of rice was rinsed with cold water. A pinch of salt was added to the boiling water. The first sample of egg was rinsed and put in the boiling rice. The pot was covered with a lid and rice boiled for 30minutes. To check the state of the rice, a spoon was inserted into the cooking rice until it touches the bottom of the pot and pulled out to check the water level and texture of the cooked rice. A second portion of rice was cooked without rinsing the egg to be place in the cooking rice.

Microbial analysis of Salmonella in cooked rice

Samples were analyzed at the Central Research Laboratory (Food laboratory), of the Polytechnic Ibadan, Oyo State Nigeria.

Preparation of Nutrient agar

Nutrient agar is a general purpose nutrient medium used for the cultivation of microbes supporting the growth of wide range of non – fastidious organisms, and was the main agar used for microbial isolation in the rice samples. 12g of Salmonella shigella agar (SSA) were weighed into 250ml of volumetric flask and 200ml of distilled water was added. It was then placed into the autoclave for sterilization at 121°C together with test tube and 200ml of distilled water for serial dilution both were sterilized in the autoclave then after sterilization, serial dilution were done with 1g of each samples at a dilution of 10^2 and 10^4 were plated and each agar were poured and allowed to cool and set and was incubated at 37°C and were observed for microbial growth after 24hours and the growth counted.

Serial dilution for Salmonella shigella agar (SSA)

Test tube and sterilized water were used for serial dilution. This was carried in four sterile test tubes with 9ml distilled water. Then four test tubes were arranged in a sequence on the test tube rack. 9ml of the distilled water was measured using sterilized needle into each testube in the rack. 1g of the cooked rice sample was introduced into the 1st test tube containing the distilled water and mixed thoroughly, represent 10^{-2}. Then 1ml from the 2nd test tube was withdrawn and used in the dilution of the distilled water in the 3rd test tube with the sterilized needle which represents 10^{-3}. Then 1ml. was measured from the 3rd test tube and used to dilute the distilled water in the 4th test tube with the sterilized needle which represents 10^{-4}. Four separate plates were prepared which was labeled SSA 10^{-2} (A), SSA 10^{-4} (A), SSA 10^{-2} (B) and SSA 10^{-4} (B) respectively.

Preparation of Nutrient Agar and serial dilution.

7.2g of Eosin methylene blue (EMB) were weighed into 250ml of volumetric flask and 200ml of distilled water was added. It was then place into the autoclave for sterilization at 121°C together with test tube. Serial dilutions were done with 1g of each sample and dilution of 10^2 and 10^4 were plated and each agar was poured and allowed to cool and set. They were incubated at 37°C and were observed for microbial growth after 24hrs and the growth were counted.

III. Results and Discussion

The result of the experiment showed the microbial analysis of Escherichia coli and Salmonella in two samples of rice cooked with egg. The E. coli count in sample A, has 0 (cfu/g), while the sample B has 1.87×10^4cfu/g and the salmonella count in sample A has 0 cfu/g, while the sample B had 1.11×10^4cfu/g. Salmonella and Escherichia coli are major food borne bacterial pathogen, with poultry and poultry products being a primary source of infection to humans [10]. Specialized agar was used to isolate and identify microbe's count in a sample of rice cooked with washed egg and rice cooked with unwashed egg shell respectively. According to [11], it was reported that several pathogenic microorganisms have been isolated from the surface of chicken egg shells and contents which includes: *Listeria monocytogenes*, *Yersinia enterocolitica*, *Escherichia coli*,*Salmonella* and *Campylobacterspp.* Aflatoxins produced by some species of fungi contaminate a vast array of food and agricultural commodities. Such mycotoxins pose profound challenges to food safety in many countries especially in tropical and subtropical regions where temperature and humidity are optimum for growth of moulds and production of toxins. Higher prevalence of E. coli was reported on eggshells from farms compared to eggs from market.

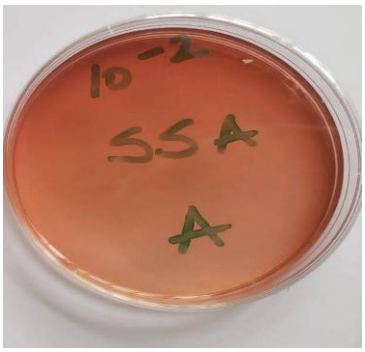

PLATE 1: Sample A 10^{-2}
Salmonella shigella

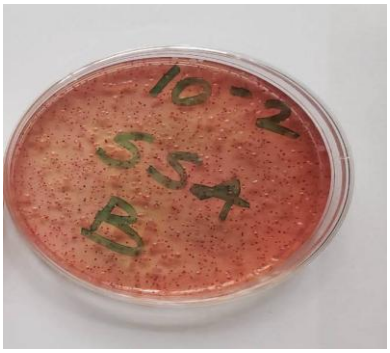

PLATE 2: Sample B 10^{-2}
Salmonella shigella

Plate 3: Sample B
Eosin Methylene blue

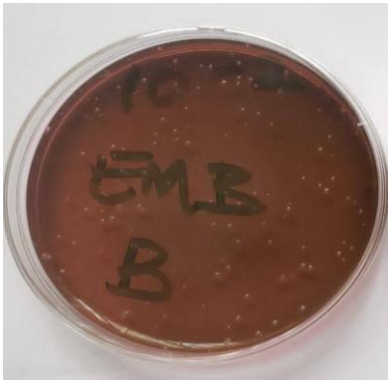

Plate 4: Sample B
Eosin Methylene blue

According to [12], the presence of *E. coli* in ready to eat foods is undesirable because it indicates poor hygienic conditions, which have lead to contamination or inadequate heat treatment. Ideally, *E. coli* should not be detected and such a high level <3 per gram (the limit of the most probable number test) has been given as the satisfactory criteria for this organism.

Table 4.1 Microbial analysis of cooked rice with egg

Parameter/sample	Escherichia coli (cfu/g)	Salmonella count (cfu/g)
Sample A	0	0
Sample B	1.87×10^{4}	1.11×10^{4}

Legend:
Sample A: Cooked rice and unshelled egg rinsed in water
Sample B: Cooked rice with unshelled egg not rinsed in water

IV. Conclusion

This study shows that the cooking of rice with unshelled egg that is not properly cleaned can pose severe health effect to people who practice such method of cooking. It is greatly encouraged that unshelled eggs should not be cooked with rice meant for consumption. It should be cooked in a separate medium. The cooking process of rice and egg in the same medium is not a hygienic method and consumption of such food may predispose people to health hazard with dear consequences.

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Ibrahim1 K.O., Jegede1O.A, et. al. "Food Safety in Cooking Rice with Unshelled EGG."*IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 17(1), (2023): pp 19-22.