Determination of Aluminum Contents of Distilled Water Heated in Aluminum Foil only, and Food Samples (moimoi) Cooked in Aluminum Foil, Plantain Leaves and Transparent Water Proof

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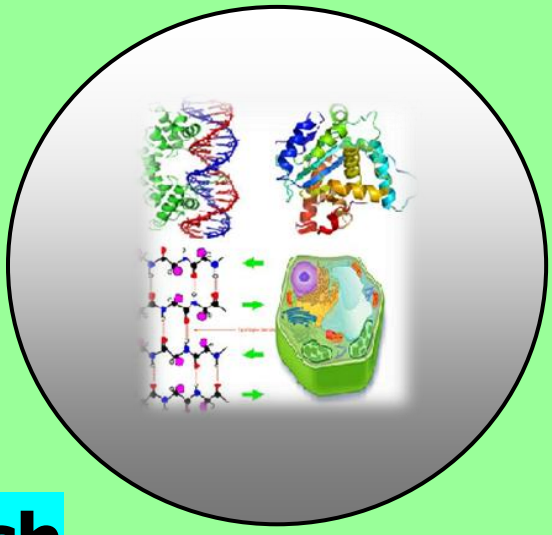

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RESEARCH PAPER

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Determination of Aluminum Contents of Distilled Water Heated in Aluminum Foil only, and Food Samples (moimoi) Cooked in Aluminum Foil, Plantain Leaves and Transparent Water Proof

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ABSTRACT

The study investigated the aluminum contents in food (Moimoi) prepared in aluminum foil, plantain leaves and transparent waterproof at temperature of 100^{o}c for 60 minutes as well as distilled water heated in aluminum foil for 30 minutes. Twenty (20) ml of acid mixture (65ml conc. HNO_3, 10ml perchloric acid and 4ml conc. H_2SO_4) was used for the digestion of the samples (moimoi). The aluminum content of the distilled water was measured before and after heating in aluminum foil at 140^{0}C.The results of this study showed that the aluminum contents of the sample wrapped in aluminum foil, plantain leaves and transparent waterproof were 0.055±.0014ppm, 0.015±.0028ppm and 0.028±.0028ppm respectively while the aluminum contents of the distilled water before and after heating in aluminum foil were 4.09±0.64ppm and 14.20±0.21ppm respectively. The results showed that there was significant increase (p<0.05) in the aluminum content of the food sample prepared in aluminum foil compared to those of the samples in plantain leaves and transparent waterproof also there was significant increase(p<0.05) in the aluminum content of the distilled water heated in aluminum foil compared to the control (raw distilled water). The result of the study suggests there is possibility of decomposition of aluminium into food prepared in aluminum foil at temperature of 100^{o}C and above. The high content of aluminum in food prepared in aluminum foil can lead to some health effects such as brain disorder and breast cancer.

Keywords: Aluminum foil, Moimoi, Waterproof, Plaintain leaf and Distilled Water.

INTRODUCTION

Aluminium foil (or aluminum foil), often referred to as tin foil, is aluminum prepared in thin metal leaves with a thickness less than 0.2 mm. Standard household foil is typically 0.016 mm (0.63 mils) thick and heavy duty household foil is typically 0.024 mm (0.94 mils).

Approximately 75% of aluminum foil is used for packaging of foods, cosmetics, and chemical products, and 25% used for industrial applications (e.g. thermal insulation, cables and electronics).Domestic uses of aluminum foil is basically in the kitchen where it may be used for cooking, wrapping, baking or storage. Studies have shown that during these domestic uses that aluminum can decompose into the food because of the effect of temperature thereby increasing the aluminum concentration that is ingested (Cassidy and Monteagudo,1998).Contact or ingestion of products containing aluminum provide more significant exposure level to aluminum (Dolara, 2014)

Aluminum health effects are far too vast to even being summarized. Aluminum reduces the growth rate of human brain cells. Growth rate decrease becomes more pronounced at higher aluminum concentration (Turhan, 2006)

The aluminum contents in grilled and baked fish fillets, with and without ingredients, wrapped in aluminum foil have been studied (WHO, 2001). The aluminum migration seems to depend on several factors, e.g. grilling duration, heating temperature, composition, food pH value, and presence of any other substances (such as organic acids and salt) (Damond, 2005).

Aluminum increases estrogen-related gene expression in human breast cancer. The estrogen-like effects of these salts have led to their classification as a metalloestrogen (Darbre, 2006).

Ganrot (1986) reported that intracellular aluminum is first confined in the lysosomes but then slowly accumulates in the nucleus and chromatin.

MATERIAL AND METHODS

Procurement of Samples

The sample (brown Beans), Crown aluminum foil (8 m x 30 m), plantain leaf, transparent waterproof used for the study were bought from relief market around Upper Iweka, Onitsha, Anambra state, Nigeria. The Distilled water used was bought from Reagent market, Headbridge, Onitsha, Anambra State, Nigeria.

Reagents: All chemicals used were of analytical grade

Preparation of the Sample (moimoi)

One hundred (100) grammes of brown beans was put into a bowl of water for 20 minutes and the transparent peel of the beans was removed until the inner white beans was obtained. Then the beans were blended and ingredients such as onion, pepper, cray fish, red oil, salt and magi were added, and then stirred for 8 minutes. The mixture of beans and ingredients was then put in aluminum foil, transparent waterproof and plantain leaf. It was boiled for 60 minutes at $100^{o}C$.

Digestion of the Sample (Moimoi)

Two grammes (2g) of moimoi was dried in an oven for 60 minutes at $100^{0}c$ .Then 2g of the dry sample (moimoi) was weighed into a digestion flask.20ml of acid mixture containing $HNO_3/HCLO_3/H_2SO_4$ in the ratio of 2:2:1 was added to the flask. The flask was heated at $250^{0}C$ till a clear digest is obtained (1 hour 30 minutes). The digest was diluted with 40ml mark of distilled water and shaken vigorously. Then the digest was centrifuged at 5000rev/min for 6minutes and then filtered with whatman No I filter paper and the filtrates were obtained. Then 10ml of the filtrates was used for the analysis using atomic absorption spectrometer (AAS) (FS 240 AAS, Agilent technologies, USA)

Preparation of the Sample (water)

The Aluminum foil was cut with scissors and then folded into the shape of a bowel. Three hundred (300) ml of water was measured and poured into the folded foil and then labeled. The oven was preheated to the temperature of 140^0C.The sample was placed in the oven and allowed to stay for 30 minutes after which it was brought out of the oven. The sample was allowed to cool and the aluminum concentration was determined.

METHOD

Aluminum Content Determination

The method of APHA (1995) was used for the aluminum content analysis.

RESULT

The results of the aluminum contents of the samples (moimoi) packaged in the different packaging materials, and distilled water heated in aluminum foil are presented in tables 1and 2.

Table 1. Aluminum contents (ppm) of Samples(Moimoi).

SAMPLES	CONC.(ppm)
Moimoi in Aluminum foil	0.055±.0014
Moimoi in white waterproof	0.028±.0028
Moimoi in plantain leaves	0.015±.0028

Table 2. Aluminum contents (ppm) of Samples (Distilled water).

SAMPLES	CONC.(ppm)
Control(distilled water)	4.09±0.64
Test Sample(Water heated in Aluminum foil)	14.20±0.21

DISCUSSION

The study investigated the Aluminum contents in food (Moimoi) prepared in aluminum foil, plantain leaves and transparent waterproof at temperature of 100^oC for 60 minutes as well as distilled water heated in aluminum foil at temperature of 140^0C for 30 minutes.

The results showed that there was significant increase($p<0.05$) in the aluminum content of the food sample prepared in aluminum foil compared to those of the samples in plantain leaves and transparent waterproof also there was significant increase($p<0.05$) in the aluminum content of the distilled water heated in aluminium foil compared to the control(raw distilled water).

Cassidy and Monteagudo (1998) reported that studies have shown that during domestic uses that aluminum can decompose into the food because of the effect of temperature thereby increasing the aluminum concentration that is ingested.

Aluminum reduces the growth rate of human brain cells. Growth rate decrease becomes more pronounced at higher aluminum concentration (Turhan, 2006)

Aluminum increases estrogen-related gene expression in human breast cancer. The estrogen-like effects of these salts has led to their classification as a metalloestrogen (Darbre, 2006).

CONCLUSION

The results of this study have shown that there is possibility of the decomposition of aluminum from aluminum foil into samples cooked (heated) in it at the temperatures used in this study. It should be suggested that the use of aluminum in processing and preparing food especially at high temperature be discouraged or significantly reduced in the interest of public health.

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