

Leaching of Aluminium from aluminium Utensils in the Kitchen Area

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Abstract - Aluminium is utilized as cooking utensils for preparing rice and other food types by normal people in southindia.if it is highly concentrated, aluminium is harmful to humans. Since water fluoride has an aluminium ability to render oxidation states. In cooking water, if fluoride is present it can improve the fascination of aluminium to the cooking medium. The natural aluminium stage and discharge of aluminium and its mixture in boiled rice while cooking and various stages are current studies in the cooking field. The amount of natural aluminium in the uncooked rice was considerably high. A rice concentration of 0.2048 mg / g Aluminium was observed. The addition of 0.0068 mg / g of aluminium to rice is seen by rice boiled at the time of the aluminium plate but without fluoride water. At a fluoride concentration of 6.3 mg / l in water, the addition of 0.1370 mg / g of aluminium was reported, which is equivalent to the highest fluoride levels in normal groundwater. In rice bubbled under ordinary water, just as in fluoride rich water, complete aluminium was discovered to be high. With the rising fluoride content in the water, it was found that when cooked in fluoride free water, the total aluminium amount in cooked rice was 0.2138 mg / g and was 0.3441 mg / g in water at 6.1 mg / l fluoride. The level of permissible ingestion of aluminium is 0.1441 mg / kg body. Weight per day per average person. Based on the assumption that per person consumes 500 g of rice/day, the aluminium Consumption is greater than 0.1441 mg / kg according to the current experiment and is therefore dangerous.

Key Words: utensils, fluoride, oxidation, ingestion, pH Value, alkaline, acidic

1. Introduction

The effect of aluminium has been documented in many workers [2, 3] and, due to this effect; a high fluoride stress indication of neurotoxin has been produced. Today, poisonous metals penetrate the body and increase, Chemical toxins such as fluoride because of aluminium utensils. Whereas fluoride alone will not cause or harm to the organ, the combination of aluminium and fluoride will affect the organ such as the kidney [6]. In 1989, the World Health Organization (WHO) reported that the Provisional Tolerance Weekly Intake of aluminium (PTWI) is 7 mg / k g body weight /week [7]. Therefore, for a person weighing 50 kg, the appropriate dose is not more than 50 mg / day. In 2006, the Joint Expert Committee on Food Additives (JECFA) (Food and Agriculture Organization / (WHO) reassessed the protection of aluminium and proposed a

fold reduction of PTWI to 1 mg / kg body weight for aluminium [8], This was due to the ability to influence, in laboratory animals, the evolving reproductive and nervous systems at doses lower than those used in the establishment of the previous PTWI.

2. Methodology

Aluminium rice cooker was bought from market which is cylindrical in shape and diameter is 20cm and height is 18 cm then one kg rice bought from market in that 200gram rice boiling using different types of water condition such as direct, ground water, packed water and corporation water and mainly different combination of sample would be taken The utensils area covered food during cooking and first introduced manual method that is 200mg rice boiled in aluminum cooker after 24 hour collected the sample and given to testing lab based on the PH value of water aluminum leaching will varying. And another type of method is there to find the aluminum leaching that is corrosion rate method before boiling should consider the weight of the aluminum cooker and after boiling should check the cooker weight then there would be a variation in weight so finally can easily find the leaching amount of aluminum materials

The formula given below for the corrosion rates

$$\text{Corrosion rate} = w / SA \text{ (mg / cm}^2\text{.h)}$$

wl -is the weight loss [mg],

S-The test specimen surface area [cm²],

A-The time of immersion [hours]

2.1 Estimated aluminum intake per person

The predictable aluminum ingestion per person which to be calculated based on fact that the assumption that an aluminum utensil of 21 cm diameter and 19 cm height is used for a family of four people (weight 60 kg) to cook one kg raw rice. The area then exposed to food during cooking is around 1440 cm².

3. Results

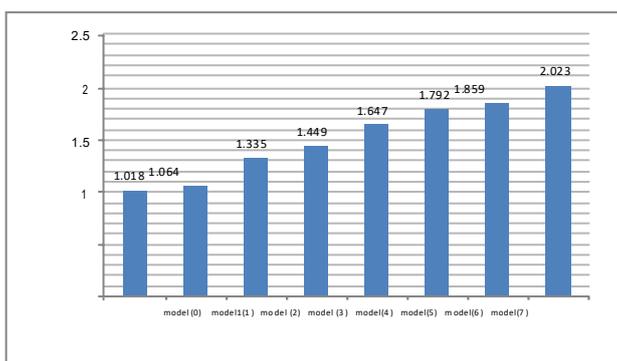
- It shows, based on the outcome, there will be a considerable amount of aluminium exist in the trial conducted.
- This will be very essential for the presence of aluminium cooked without the aluminium plate is even in the blank rice sample.
- The raw rice trail has an average of 0.2039 mg / g, which is the lowest concentration of aluminium. In a sample cooked with water containing the excessive fluoride absorption (0.3390 mg / l), the highest level was detected.

Model Number	Number of samples taken for the analysis	Mean value of aluminium present in the 1g of rice samples (µg/kg)
Model 1	I	1450
Model 2	II	1500
Model 3	III	1550

Absolute aluminium in a study of cooked rice, Aluminium is not listed as exist in rice, according to the USDA Food Standard Database [8]. However, the few amount of raw rice sample bought from the local Indian bazaar showed a considerable aluminium level of 0.2039 mg / g. Aluminium in local raw rice it is therefore important to further investigate

There are a number of reasons for the existence of aluminium in raw rice. It might be owing to the Method of rice doling out, the aluminium level of irrigation water, the soil aluminium level, etc.

Total diet exposure of aluminium



Ingestion of aluminium per one kg of body mass (mg / kg)

This estimate is based on the premise that the aluminium utensil has a diameter of 21 cm and a 19 cm in height is used to cook one kg of raw rice in a family of four (60 kg in weight), The area exposed to food while cooking is approximately 1441 cm², calculated values for both samples were higher than that as compared to the (2006) JECFA protection

Aluminium level [9] of 0.1431 mg / kg of body weight. Aluminium is incorporated by leaching by the presence and absence of fluoride. Therefore, people in India are at threat of extreme ingestion of aluminium, particularly in areas where fluoride is rich in groundwater. In addition, rice alone can have a large amount of aluminium.

Diet aluminium exposure from utensils. The findings indicate that a large amount of aluminium is present in the natural testing of raw rice.

It is possible to recalculate by deducting the total amount of aluminium that occurs in raw market rice exposures due to the leaching of aluminium utensils

Level of corrosion

The aluminium corrosion rates mainly focused on area of the aluminium utensils, the rice itself, the concentration of fluoride and the length of the cooking time.

Table displays the corrosion rate for various fluoride levels. The highest and lowest corrosion concentrations are 0.3130 (mg / cm²) and 0.0144 (mg / cm²) for 30 minutes of cooking time. The highest rate of corrosion is observed when cooked with 6 mg / l of fluoride water and the lowest rate of corrosion in cooking where fluoride is free of water. There is an increase in the rate of corrosion with respect to the concentration of fluoride. Even the result shows that rice alone can leach aluminium.

4. Conclusion

- The present study indicated that use of aluminium utensils in the presence of fluoride rich water for

Fluoride intensity of water used to boiled rice for 30 minutes.(mg/l)	Loss of weight of aluminium sample	Level of rust (mg/cm ² . hr) 10-2
0	0.0652	01.40
1	0.4242	09.79
2	0.5779	13.4
3	0.8472	19.6
4	1.0395	24.1
5	1.1292	26.2
6	1.3472	31.2

cooking pose a threat to the rice consumer with increased aluminium intake.

- Raw rice appears to contain significant amount of aluminium.
- Aluminium leaching from aluminium utensils increase with the increasing fluoride content in cooking water.
- Combined aluminium contribution from rice, cooking utensils, and other food such as curries

cooked in aluminium utensils particularly in acidic medium could be higher than the acceptable levels and hence pose a threat to consumer especially in the areas of fluoride rich ground water.

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