

CHRONIC RENAL FAILURE IN THE MEDAWACHCHIYA-PADAVIYA AREAS: A GEO-ENVIRONMENTAL STUDY

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While the etiology of the chronic renal failure in the Medawachchiya-Padaviya areas still remains a mystery, some results on the geo-environmental factors of the region reveal some significant findings. A chance discovery made during field studies was that people exclusively use aluminium utensils and that holes were observed in these utensils after continuous use. Water used by these people mostly come from dug wells and they generally have high fluoride content in the range of 1.00-4.00 ppm with a median of around 1.3 ppm. Fluoridation of drinking water is in the midst of a controversy owing to studies, which have shown a direct link between aluminium and fluoride to Alzheimer like symptoms in experimental animals. A cocktail of aluminium and fluoride laced water given to rats showed that the animals develop Alzheimer like symptoms but their premature deaths were attributed to kidney failure. The ability of the aluminofluoride complexes to penetrate the blood-brain barrier has been forwarded as a possible explanation for this observation. The present study aims to establish any relationship between fluoride, aluminium utensils and chronic renal failure.

In this study pieces of aluminium from a used aluminium pot were treated with fluoride water containing at different levels of 1.0-4.0 ppm. After two days of standing at room temperature, the amount of aluminium leached was measured by a colorimetric technique (aluminon reagent) to determine uncomplexed aluminium and atomic absorption spectrophotometry to determine total aluminium. The amount of aluminium leached out in the absence of fluoride was 0.43 ppm while in 1 ppm fluoride medium the free aluminium observed was 3.00 ppm where the total aluminium was 11.87 ppm. Surprisingly, the amount of aluminium leached was lower at higher concentrations of aluminium. This observation is similar to the results from studies on rats where lower concentrations of aluminum fluoride produced more toxic effects than at higher concentrations. In the presence of an acidic medium, using 2g/l of tartaric acid and 1 ppm fluoride, the aluminium leached was around 56 ppm which is a five-fold increase in the dissolution of aluminium. This experiment was performed owing to the widespread use of acidic ingredients like tomatoes, tamarind, vinegar and limejuice during cooking in aluminium pots.

Aluminium leaching under high fluoride stress and acidic spices results in the formation of aluminofluoride complexes such as AlF_6^{3-} , which are soluble and penetrates the blood brain barrier. This stable AlF_6^{3-} complex has an overall formation constant of 6.9×10^{19} . The observation of both dental and skeletal fluorosis amongst the affected patients gives further credence to the hypothesis that aluminium and fluoride in combination could be a possible reason for the occurrence of chronic renal failure in areas with high fluoride content in water.

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