# Spatial Distribution of Fluoride in Well Water of Sri Lanka and its Removal

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It is reported by the United Nations Children's Fund (UNICEF) that diagnostics of fluorosis, such as dental fluorosis and bone fluorosis caused by excess fluoride in drinking and cooking water is observed in 25 countries in the world, and the number of the patients could be tens of millions[1]. In a report of the World Health Organization (WHO), more than 70m people were estimated to be suffered from fluorosis globally. Many of the people in such countries rely on ground water for their drinking water as they are unable to access any other water resources. Fluoride removal from water for drinking and cooking is needed for such people to prevent health problems. Sri Lanka is one of the 25 countries in which many people suffer from dental fluorosis and bone fluorosis. However, no detailed investigation of well water quality has been conducted in the country due to the long lasting civil war and lack of equipment.

In this research, 1,304 well waters were sampled from the whole of Sri Lanka to establish a spatial distribution of fluoride concentration. In order to remove fluoride, a filter for a household and a filter for a community packed with Chicken Bone Char (CBC)were developed in Sri Lanka to check on their performance. An electrolysis system equipped with a diaphragm made with a clay panel to separate the cathode bath from the anode bath using carbon electrodes was also investigated for use in removing fluoride from the well water.

The CBC filter for a household was operated in a residential house in Dambulla with the cooperation of the family. It was found that about 1,300 l of well water could be treated with 560 g of CBC. With the success of the household level filter, the community based filter was tested at Wilgamuwa village, located in the eastern boundary of the Matale district in the central province of Sri Lanka. The operating capacity of this filter was 150 l/day. The total amount of CBC used for this filter was 23 kg. Treated water for 142 days, equivalent to 21.3 $m^3$, was found to be totally free from fluoride. The CBC filter was confirmed to be able to remove fluoride effectively from drinking water in Sri Lanka.

The electrolysis system to remove fluoride was studied in the laboratory. In this system, fluoride is removed by co-precipitation with magnesium hydroxide formed in the cathode bath. The removal rate of fluoride, which was 60-80%, depended heavily on the magnesium concentration of the well water. It was shown to be applicable to well water with high concentration of magnesium in the dry zone of Sri Lanka found in regions such as Anuradhapura and Polonnaruwa.

## Reference

1. J. Qian, A. K. Susheela, A. Mudgal and G. Keast, Fluoride in water: An overview, Waterfront: A UNICEF Publication on Water, Environment, Sanitation and Hygiene, 1999, **13**, 11-13