

Effect of Concentrated Water from Reservoirs of High Prevalence Area for Chronic Kidney Disease of Unknown Origin in Sri Lanka on Mice

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There is threateningly high prevalence of chronic kidney disease due to tubulointerstitial disease ending as chronic renal failure in the North Central Region of Sri Lanka. The epidemiology of the disease shows distribution of these patients around some water reservoirs and most of them are farmers. The low prevalence of the disease among the villagers who use water from the natural springs was observed. The aim of the study was to find the potential effects of concentrated water of the reservoirs in the high-prevalence area by mouse bioassay.

Water of Padaviya reservoir supplying water to a high disease prevalent area was concentrated fifteen times by evaporation, exposing to sunlight from the month of May to July. The test group of mice (n=20) and control group (n=15) were fed with concentrated reservoir water and water from non-prevalence area (Kandy) respectively, for a period of 6 months and the kidneys were examined histopathologically for evidence of renal disease. Water samples were analyzed for Fluoride, Na⁺, K⁺, heavy metals and for cyanobacterial toxins microcystin and cylindrospermopsin.

The analysis of concentrated water samples from Padaviya reservoir from May to July showed a significantly higher content of fluoride (2.25±0.7 mg/L) and sodium (225±62 mg/L) (p<0.05) than control samples. However, no increased levels of heavy metals were detected. The analysis of water samples from Padaviya reservoir showed the presence of Deoxycylindrospermopsin (1.28 ug/L; DCYN) as the predominant isomer present over cylindrospermopsin (CYN), which is unusual. At the end of 6 months, interstitial nephritis was detected in 45% of test mice and only 6.5% of control group (p < 0.001).

The results show the ability of the water of this reservoir to induce interstitial nephritis that could be due to the high salinity, fluoride or due to DCYN. Although present in low levels, the possibility DCYN to induce interstitial nephritis needs to be investigated further as the epidemiological evidence is in favor of a cyanobacterial toxin. The long term effects and safe levels for DCYN in drinking water and the effect of salinity and high fluoride content of water need to be studied.

Partially funded by South Asian Clinical Toxicology Research Collaboration

