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Evidence for the presence of microcystins and nodularin in water and edible plant materials collected from chronic kidney disease of unknown origin endemic Girandurukotte area, Sri Lanka

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Background: Cyanobacteria are photoautotrophs are ubiquitous. Several cyanobacterial species produce toxic secondary metabolites known as cyanotoxins. Cyanotoxins are an important risk factor for Chronic Kidney Disease of unknown origin (CKDu) in Sri Lanka.

Objective: This study focused on determining microcystins and nodularin cyanotoxins in water resources located in a high CKDu area in Sri Lanka, Girandurukotte.

Method: Water samples and selected edible plant materials were collected from CKD, CKDu, and healthy individuals. Totaling 57, well water samples from CKDu (n=28), CKD (n=8), and healthy individuals (n=10), reservoirs (n=6), water treatment plants (n=3), and other water sources (n=2) were collected. Collected edible plant materials (n=52) included rice (n=33), pea (n=8), pennywort (n=6), luffa (n=3) and cowpea (n=2). Microcystin (MC) variants and nodularin (NOD) were extracted from both filters and filtrates of the water samples and homogenized plant materials using standard methods. They were then subjected to High-Performance Liquid Chromatography with Photodiode Array Detection (HPLC-PDA). Microcystin standards, which were purified from culture isolates EF051238.1 and EF051239, and nodularin standard 32539 were used to detect MC and NOD by comparing the peak retention time.

Results: Chromatograms obtained from 93.0% of filters and 85.0% filtrates revealed major peaks corresponding to MC variants in water sources. MC variants were present in all the analyzed water samples of CKDu, CKD, healthy individuals' water samples, and reservoirs except one CKDu and one reservoir sample. HPLC analysis has shown that 90.0% of plant materials' retention times coincided with one or more retention times of microcystin variants, including 50.0% pennywort and 75.0% pea samples. A filtrate sample from a CKDu patient's well water and two cowpea samples showed positive peaks for NOD.

Conclusion: Results indicate the presence of cyanotoxins in water sources and plants in CKDu endemic areas. The study is in progress to find the relationship between cyano-toxicity and the disease CKDu.

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