

0540
DEV

06

**PESTICIDE RESIDUE ANALYSIS OF DRINKING WATER IN
GIRANDURUKOTTE AREA WHERE CHRONIC KIDNEY
DISEASE IS PREVALENT**

A PROJECT REPORT PRESENTED BY

AMILA MANURADHA DEVASURENDRA ✓

to the Board of Study in Chemical Sciences of the
POSTGRADUATE INSTITUTE OF SCIENCE

*in partial fulfillment of the requirement
for the award of the degree of*

MASTER OF SCIENCE IN ANALYTICAL CHEMISTRY

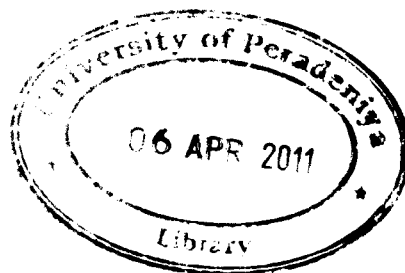
of the

UNIVERSITY OF PERADENIYA

SRI LANKA

2010

641574



**PESTICIDE RESIDUE ANALYSIS OF DRINKING WATER IN
GIRANDURUKOTTE AREA WHERE CHRONIC KIDNEY
DISEASE IS PREVALENT**

Amila Manuradha Devasurendra

Department of Chemistry

University of Peradeniya

Peradeniya

Sri Lanka

About 20 years ago, an apparently new form of Chronic Kidney Disease of unknown aetiology (CKDu) emerged mainly in the North Central Region of Sri Lanka, and also in some areas of the North Western and Uva Provinces (Girandurukotte). In the North Central Province, a high prevalence was observed in Medawacchiya, Padaviya, Dehiattakandiya, Medirigiriya and recently in the Nikawewa area in the North Western Province. This disease is characterized by a slow, progressive, asymptomatic development, frequently starting in younger age groups. Widespread use of agrochemicals such as pesticides and heavy metals in soil and water sources, and the presence of high levels of fluoride in the environment could be postulated as contributing factors to the high prevalence of CKD in these areas. Mycotoxins, use of herbal or ayurvedhic medicines, smoking and history of snake bite are other possible factors.

However, there is a tendency for it to be more prevalent among men engaged in agriculture, typically around the age of 40-60 years. Although a range of studies of varying types have been carried out over the years, with a view to elucidating the prevalence, the nature and cause of CKDu, have not indicated any definite evidence to support a particular environmental nephrotoxin up to now. Therefore, the main objective of this research is to investigate the pesticide content in the drinking water which is suspected to be one of the main causes for the chronic kidney disease of unknown aetiology in the Girandurukotte area.

In this study the main objective was to test the quality of water with respect to pesticide content covering the entire Girandurukotte area. Altogether, sixty drinking

samples from dug wells and tube wells were obtained with a sampling frequency of three (20 samples in each day) which was carried out from October 2008 to June 2009. Apart from those sixty samples, another set of ten samples was collected from district of Kandy including Peradeniya, Gampola and Katugasthota areas as control sample. All the samples were collected into dry 500 cm³ pre-cleaned amber coloured glass bottles and transported to the laboratory and kept under refrigeration conditions (at 4 °C) until chemical analysis was performed.

The pH and the conductance of water samples were measured at room temperature before refrigeration, soon after the samples were brought to the laboratory. The COD value of the each sample was determined using the open reflux method. Liquid-liquid extractions of collected water samples were carried out with dichloromethane. Then the combined successive extractions were concentrated and the residue was dissolved in 5.0 cm³ of hexane and analyzed with a gas-liquid chromatograph equipped with an electron capture detector.

In general, the pH and the conductivity values for all samples show values within the acceptable range for drinking water whereas, the COD values are significantly high indicating that there are some organic materials in their drinking water. According to the gas-liquid chromatographic analysis, there are some characteristic peaks in all samples which can be identified as organic pesticides such as Diazinon, Dimethoate, Chlorpyrifos and Phenthoate by comparing with the standard samples which were done at identical conditions.

The gas-liquid chromatographic analysis for pesticides of drinking water samples of the Girandurukotte area indicates that almost all the samples contain commonly used pesticides although the results were not confirmed by Gas Chromatography coupled with Mass Spectroscopy (GC-MS). Furthermore, the results indicate that pesticides, Dimethoate and Diazinon present in harmful levels. The presence of pesticides in drinking water resources simultaneously with other possible nephrotoxins such as heavy metals and fluoride may contribute to CKDu synergistically.