

Liquid Chromatography Microfluidics for Detection and Quantification of Urine Albumin Using Linear Regression Method

Authors : Patricia B. Cruz, Catrina Jean G. Valenzuela, Analyn N. Yumang

Abstract : Nearly a hundred per million of the Filipino population is diagnosed with Chronic Kidney Disease (CKD). The early stage of CKD has no symptoms and can only be discovered once the patient undergoes urinalysis. Over the years, different methods were discovered and used for the quantification of the urinary albumin such as the immunochemical assays where most of these methods require large machinery that has a high cost in maintenance and resources, and a dipstick test which is yet to be proven and is still debated as a reliable method in detecting early stages of microalbuminuria. This research study involves the use of the liquid chromatography concept in microfluidic instruments with biosensor as a means of separation and detection respectively, and linear regression to quantify human urinary albumin. The researchers' main objective was to create a miniature system that quantifies and detect patients' urinary albumin while reducing the amount of volume used per five test samples. For this study, 30 urine samples of unknown albumin concentrations were tested using VITROS Analyzer and the microfluidic system for comparison. Based on the data shared by both methods, the actual vs. predicted regression were able to create a positive linear relationship with an R^2 of 0.9995 and a linear equation of $y = 1.09x + 0.07$, indicating that the predicted values and actual values are approximately equal. Furthermore, the microfluidic instrument uses 75% less in total volume – sample and reagents combined, compared to the VITROS Analyzer per five test samples.

Keywords : Chronic Kidney Disease, Linear Regression, Microfluidics, Urinary Albumin

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