ORIGINAL ARTICLE

Determination of uric acid level by polyaniline and poly (allylamine): Based biosensor

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ABSTRACT

The uric acid biosensor has been much developed by immobilizing uricase enzyme into the membrane of conductive polymer and the membrane of polyelectrolyte such as polyaniline (PANI) and poly (allylamine) (PAA) respectively. The purpose of this research was to create a new amperometric uric acid biosensor by immobilization of uricase in combination between PANI and PAA membranes. The working electrode was Pt plate (0.5 mm). The auxiliary and the reference electrode were Pt wire 0.4 mm and Ag/AgCl respectively. Uricase, uric acid, PAA, pyrrole and glutaraldehyde were supplied from Sigma. All other chemical was obtained from Merck. The biosensor was created by immobilizing of uricase by a glutaraldehyde crosslinking procedure on PANI composite film on the surface of a platinum electrode while the polyelectrolyte layer of PAA were prepared via layer-by-layer assembly on the electrode, functioning as H_2O_2-selective film. Standard of deviation, coefficient of variation (CV) and coefficient of correlation (*r*) analysis were used in this study. The biosensor had a good linearity with a correlation coefficient of 0.993 and it could be used up to 27 times with the CV value of 3.97%. The presence of other compounds such as glucose and ascorbic acid gave 1.3 ± 1.13% and 3.27 ± 2.29% respectively on the interference effect toward the current response of uric acid biosensor. The polymer combination of PANI and PAA can be used as a selective matrix of uric acid biosensor.

Key words: Biosensor, electropolymerization, poly (allylamine), polyelectrolyte such as, polyaniline, uric acid, uricase

INTRODUCTION

Uric acid is the substance of the final product of nucleic acid or purine metabolism in human body.[1] In the event of irregularities in this process the uric acid levels increases and it will cause hyperuricemia and gout diseases.[2] Therefore, uric acid measurement for diagnosis and treatment of these disorders is routinely required. Many of the methods are available for the determination of uric acid and one of the method that provide many advantages is amperometric biosensors.[3]

The determination of uric acid level with biosensor method has been developed by the immobilization of the enzyme uricase in both the conductive polymer and polyelectrolyte membrane such as polypyrrole, polyaniline (PANI) and polyfenilendiamina.[3-6]

Conductive polymers are widely used in enzyme immobilization, which has better as conductor in electricity and has a variety of structures at a relatively inexpensive price and also easy to be made.[7] PANI, for instance, is widely used as a matrix for the immobilization of several enzymes due to its stability, easy synthesis and high conductivity.[7,8] A research was conducted by Kavita Arora *et al*. (2007) regarding the immobilization of uricase into PANI with a cross-linking method with the addition of glutaraldehyde. Moreover, PANI can also be combined with polypyrrole as a matrix for immobilization of uricase in production of uric acid biosensor.[53]

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