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Research Article

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Synthesis of selective molecularly imprinted polymer for solid-phase extraction of glipizide by using a pseudo-template

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ABSTRACT

Selective molecularly imprinted polymers (MIPs) for solid-phase extraction and determination of glipizide have been designed and prepared. MIPs were synthesized with acrylamide as the functional monomer and ethyleneglycoldimethacrylate as the cross-linker in chloroform as a porogenic solvent by using bulk polymerization method. MIPs are able to bind 100% glipizide in chloroform by using a batch method compared to a non-imprinted one. By using Fourier Transform Infra Red, it was found that hydrogen bonding occurred between the carbonyl group of acrylamide and the proton donor of template. These results find the opportunity for this MIP to be used as an alternative of the pretreatment method before determination of glipizide by using glibenclamide as a pseudotemplate.

Keywords: molecularly imprinted polymer, pseudo-template, solid-phase extraction, sulfonylurea drugs, glipizide.

INTRODUCTION

Glipizide is a sulfonylurea class of antidiabetic drug that can lower blood glucose levels by stimulating the release of insulin from β-cells [1]. This compound is the most potent drug amongst the sulfonylureas [2]. Analytical techniques such as reversed-phase high-performance liquid chromatography [3,4] ion-pair high-performance liquid chromatography [5] and mass spectroscopy liquid chromatography [6] have been developed and used to monitor glipizide level in plasma. These methods have complicated procedures for pretreatment sample and high costs of instruments because of the sample matrices. All the methods need liquid-liquid extraction for the sample separation method. This kind of extraction has a problem in recovery of the sample, needs a lot of time, and has high solvent consumption [7,8].One of the separation methods that is popular is solid-phase extraction (SPE), which is faster, and more efficient than liquid-liquid extraction. However, SPE has low selectivity and this becomes a problem when it deals with complex biological samples or environmental samples or if analyte present in low concentration [8]. Higher selectivity of the sorbent can be increased by using molecular imprinting technique [9].

Molecular imprinting is a simple technique for preparing tailor-made affinity adsorbents that posses specific binding sites within polymer matrices. MIPs has an excellent properties to separate many interesting compounds [10]. MIPs are cross-linked synthetic polymers obtained by copolymerizing a monomer with a cross-linker in the presence of a template molecule (print molecule) in a solvent as a porogen. The polymer, with its template being washed away, contains recognition sites that are complementary in size, shape, and chemical functionality to the template molecules. Thats why the produced imprinted polymer is able to rebind selectively with analyte or its analogous structures. MIPs has a several advantages which is low cost, ease of preparation, and good physical and chemical stability over a wide range of experimental conditions and solvents like extreme pH. MIPs able to bind specifically to their original and related templates, and having tolerance to mechanical stress, temperature, pH, acid-base, etc. [11,12].In order to improve the properties of MIPs being developed, computer-aided study of MIP has