Research in Pharmaceutical Sciences, 2012;7(5)
School of Pharmacy and Pharmaceutical Sciences
Isfahan University of Medical Sciences

The use of magnetic nanoparticles incorporated to carbon from agricultural wastes (MNICAW) to remove amoxicillin from aqueous media

M. Kazemipour[1], A. Babapour[1], M. Ansari[2,*]

[1]Department of Chemistry, Faculty of Sciences, Islamic Azad University, Kerman Branch, Kerman, Iran
[2]Pharmaceutics Research Center, Faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran

Background and Aims: The occurrence of antibiotics in the environment has received considerable attention. Another concern about antibiotic residues in the environment is their potential adverse effects to various organisms. Removal of antibiotics from wastewater has great concern regarding to prevention of bacterial resistance and side effects. Magnetic nanoparticles are of great interest for researchers from a wide range of disciplines, including magnetic fluids, catalysis, biotechnology, biomedicine, magnetic resonance imaging, data storage, and environmental remediation. Adsorption is now evolving as a front line of defense. The adsorption of amoxicillin on the magnetic nanopartilces was used to separate amoxicillin from aqueous media in this study.
Methods: Amoxicillin concentrations were measured using a simple spectrophotometric method that was developed and appropriately validated. The parameters affecting amoxicillin adsorption such as pH, temperature, time, interferences of similar molecules and the amount of adsorbent used were studied. Amoxicillin adsorption using MNICAW was compared to that using multi-walled carbon nano-tubes (MWCNTs) and activated carbon (AC).
Results: The results of analytical method validation showed proper linear regression with the resulting equation y=0.0228x+0.001 (R2=0.9999) with suitable precision and accuracy over the range of 1-80 mg/L. The adsorption efficiency of 0.2 and 0.25 g of MNICAW using in a continuous mode were 84.9, and 90.7%, respectively. Evaluation of the adsorbent capacity showed that each gram of MNICAW can adsorb 7.0 mg amoxicillin. The adsorption of amoxicillin on MNICAW in conditions optimized in this study was much greater than MWCNTs and AC. Considering the high capacity of MNICAW for amoxicillin adsorption it appears that these materials can play an effective role in amoxicillin removal from contaminated aqueous solutions.
Conclusions: Removal of antibiotics from wastewater to reduce its side effects and bacterial resistance by natural sources coupled with nanotechnology is promising procedure of green pharmacy .

Keywords: Amoxicillin; MNICAW; Adsorption