

## Study on the adsorption of ciprofloxacin on particles containing magnetic nanoparticles (PCMN) from water

M. Ansari<sup>1,\*</sup>, A. Hassanzadeh<sup>2</sup>, M. Kazemipour<sup>2</sup>

<sup>1</sup>Pharmaceutics Research Center, Faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran

<sup>2</sup>Department of Chemistry, Faculty of Sciences, Islamic Azad University, Kerman Branch, Kerman, Iran

**Background and Aims:** Ciprofloxacin is active against many pathogenic bacterial species as gyrase inhibitor, which selectively inhibit bacterial DNA synthesis. Among the techniques for removal of ciprofloxacin from wastewater, adsorption has been proved to be an effective and attractive process because of its inexpensive nature and ease of operation. Adsorption of ciprofloxacin on PCMN has been studied.

**Methods:** Ciprofloxacin was determined by a fully validated spectrophotometric method. The parameters affecting ciprofloxacin sorption such as pH, temperature, time, interferences of similar molecules and the amount of adsorbent used were investigated. Ciprofloxacin sorption using PCMN was compared to that using MWCNTs and activated carbon (AC).

**Results:** The results of analytical method validation showed proper linear regression with the resulting equation  $y=0.0955x+0.0019$  ( $R^2=0.9997$ ) with suitable precision and accuracy over the range of 1-20 mg/L. The adsorption efficiency of 0.03 and 0.15 g of PCMN using in a continuous mode were 97.4, and 99.34%, respectively. Evaluation of the adsorbent capacity showed that each gram of PCMN can adsorb 19.1 mg of ciprofloxacin. The effect of pH was studied over the range of 2-10 and revealed that adsorption of the ciprofloxacin at the initial pH of 5.3 was more effective than any other pH. The adsorption of ciprofloxacin on PCMN in conditions optimized in this study was much greater than MWCNTs and AC. To evaluate the adsorption mechanism all data were fitted to adsorption isotherms and the data were best fitted to the D-R isotherm in the range of 2-80 mg/L.

**Conclusions:** Ciprofloxacin adsorption on PCMN can play an important role on the removal of it from aqueous media and can be used in preconcentration and analysis of trace level of the drug.

**Keywords:** Ciprofloxacin; PCMN; Adsorption