Magnetic nanoparticles assisted dispersive liquid– liquid microextraction of chloramphenicol in water samples

ABSTRACT

This work describes the development of a new methodology based on magnetic nanoparticles assisted dispersive liquid–liquid microextraction (DLLME-MNPs) for preconcentration and extraction of chloramphenicol (CAP) antibiotic residues in water. The approach is based on the use of decanoic acid as the extraction solvent followed by the application of MNPs to magnetically retrieve the extraction solvent containing the extracted CAP. The coated MNPs were then desorbed with methanol, and the clean extract was analysed using ultraviolet–visible spectrophotometry. Several important parameters, such as the amount of decanoic acid, extraction time, stirring rate, amount of MNPs, type of desorption solvent, salt addition and sample pH, were evaluated and optimized. Optimum parameters were as follows: amount of decanoic acid: 200 mg; extraction time: 10 min; stirring rate: 800 rpm; amount of MNPs: 60 mg; desorption solvent: methanol; salt: 10%; and sample pH, 8. Under the optimum conditions, the method demonstrated acceptable linearity (R 2 = 0.9933) over a concentration range of 50–1000 µg l–1 . Limit of detection and limit of quantification were 16.5 and 50.0 µg l–1 , respectively. Good analyte recovery (91–92.7%) and acceptable precision with good relative standard deviations (0.45–6.29%, n = 3) were obtained. The method was successfully applied to tap water and lake water samples. The proposed method is rapid, simple, reliable and environmentally friendly for the detection of CAP.

Keyword: Dispersive liquid–liquid microextraction; Magnetic nanoparticles; Chloramphenicol; Water samples; Spectrophotometry