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Highly sensitive detection of Ceftriaxone in water, food, pharmaceutical and biological samples based on gold nanoparticles in aqueous and micellar media

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Abstract

A colorimetric assay with excellent sensitivity is reported to detect Ceftriaxone in aqueous and micellar solutions. Ceftriaxone could induce the aggregation of gold nanoparticles through hydrogen-bonding interaction and electrostatic attraction. As a result of aggregation, the surface plasmon resonance band around 520 nm decreases and a new band appears at 620 nm. The effect of surfactants was investigated on the aggregation. The band around 620 nm is shifted to around 685 nm in Triton X-100 micellar media and that is seen color conversion from red to deep blue which is clearly detectable by the naked eye. The results were improved in Triton X-100 micellar media as compared to aqueous media so that the lowest measured concentration and detection limit in micellar media have decreased 10 and 8 times, respectively. Triton X-100 showed strong effect on the stabilization of the solutions. The method has been successfully applied for the analysis of various real samples.

Keywords: Ceftriaxone; colorimetric method; gold nanoparticle; surfactant; Triton X-100.

Introduction

Ceftriaxone (Cef) is a cephalosporin antibiotic used in the treatment of bacterial infections [1]. Cephalosporins are widely used in veterinary medicine. Inappropriate consumption of cephalosporins as veterinary medicine for growth promotion and disease therapy may result in presence of residues in milk and meat products and cause human health hazards. The presence of residues in food can lead to health problems for individuals who are hypersensitive to antibiotics and also low-level doses of antibiotics in foodstuff for long periods has led to the problem with the spread of drug-resistant microorganisms[2]. Because of those concerns, the use of

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