GOLD NANOPARTİCLES DECORATING OF MULTIWALLED CARBON NANOTUBES AS NEW TOOLS TO PROMOTE OF SENSITIVE CLINICAL DETECTION OF CLARITHROMYCİN IN PHARMACEUTICAL SAMPLES

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The electrochemical behavior of clarithromycin hydrochloride as an antibiotic was studied in the multiwalled carbon nanotubes (MWCNTs), decorated with Au nanoparticles (GNMWCNTs) and used for the modification of the glassy carbon electrode (GCE), through cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). Even though clarithromycin has a high oxidation potential on the GCE, it can be oxidized much better on the GNMWCNTs due to electrocatalytic effect of nano gold decorated on MWCNTs modified electrode. Under optimized conditions, the oxidation peak current was dependent on the clarithromycin concentration and was linear in the ranges of 0.10 – 1000 μmol L⁻¹ with a detection limit of 0.01 μmol L⁻¹ (3 S/N).

In this work we describe the use of multiwalled carbon nanotubes decorated with Au nanoparticles(GNMWCNTs) for modifying the surface of glassy carbon electrode (GCE) in order to develop a sensitive, selective, and useful sensor for the determination of clarithromycin. The proposed method is based on the specific properties of GNMWCNTs such as strong adsorptive ability, huge specific area, suitable electronic property, and excellent electrocatalytic activity. The procedures does not require sample pre-treatment or any time-consuming extraction step prior to drug assay.

To evaluate the applicability of the proposed sensor, the recovery of clarithromycin was determined in tablet, injection ampoule, plasma, and urine samples by spiking the samples with standard values of clarithromycin. The standard addition method was used for the analysis.

Nowadays, clarithromycin is a macrolide antibiotic used to treat pharyngitis, tonsillitis, acute maxillary sinusitis, acute bacterial exacerbation of chronic bronchitis, pneumonia skin and skin structure infections. In addition, it is sometimes used to treat legionellosis, helicobacter pylori, and lyme disease [1-3]. Therefore, selective, sensitive and simple determination of clarithromycin in biological samples is very important. As mentioned before, the electrochemical response of clarithromycin on the GNMWCNTs modified electrode is enhanced by using gold nanoparticles due to its catalytic effect on the electro-oxidation of clarithromycin. It was also shown that the proposed sensor is a leading electrochemical method in analyzing clarithromycin with a satisfactory sensitivity and determination range and with a low experimental detection limit of 0.01 μmol L⁻¹. Based on our findings, this modified electrode can be satisfactorily used for the determination of clarithromycin in pharmaceutical and urine samples.

References