Enhancing clenbuterol immunosensor based on poly(3,4-ethylenedioxythiophene)/multi-walled carbon nanotube performance by response surface methodology

ABSTRACT

Clenbuterol (CLB) is an illegal antibiotic for livestock, which is misused as a growth promoter drug. In this study, an immunosensor modified with poly(3,4-ethylenedioxythiophene) (PEDOT), multi-walled carbon nanotubes (MWCNT) and anti-clenbuterol antibody (Ab) was developed for the detection of CLB. A screen-printed carbon electrode (SPCE) was modified with PEDOT/MWCNT as a sensor platform before immobilizing Ab for specific CLB binding through a competitive-type immunoassay. Free CLB in the sample solution competed with clenbuterol-horseradish peroxidase (CLB–HRP) to bind with Ab. A high current signal was obtained after optimization of the electrochemical immunoassay conditions (pH, incubation temperature, antigen (Ag) incubation time and % blocking) using the response surface methodology/central composite design (RSM/CCD). The developed immunosensor is highly reproducible and sensitive with good storage stability, which are necessary for practical application. In real sample application, this immunosensor produces comparable results with liquid chromatography-mass spectrometry; thus, it is useful for CLB screening and monitoring in real meat samples.

Keyword: Clenbuterol; Illegal antibiotic; Livestock