UNDERSTANDING ELECTROCHEMICAL MECHANISM OF EPIRUBICIN ON GLASSY CARBON ELECTRODE VIA MODEL PHARMACEUTICALS

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Electrochemical mechanism of drug substances plays great importance to understand their in vivo actions in body. One of the antineoplastic drug molecule with an anthracycline structure (10-(4-amino-5-hydroxy-6-methyl-oxan-2yl)oxy-6,8,11-trihydroxy-8-(2-hydroxyacetyl-1-methoxy-9,10-dihydro-7H-tetracene-5,12-dione) epirubicin was electrochemically analyzed on the oxidation pathway. To the best of our knowledge, there exists no electrochemical study on epirubicin oxidation mechanism.

In this study, cyclic (CV), linear sweep (LSV), differential pulse (DPV) and square wave (SWV) voltammetric techniques were used for understanding electrochemical oxidation pathway of epirubicin using glassy carbon as working electrode, a Ag/AgCl (3M KCl) as reference electrode and platinum-wire as auxiliary electrode. The effect of pH, nature of the supporting electrolytes and scan rate differences were investigated. The electro-oxidative behavior of epirubicin was well characterized with the help of various supporting electrolytes including H2SO4, phosphate, acetate and Britton-Robinson buffers in different pH values between 0.3 and 10.0 containing 20% methanol.

Scan rate studies were performed in the selected media, 0.1 M H2SO4, acetate buffer at pH 5.5 and phosphate buffer at pH 7.75 to understand the electron transfer process to the electrode surface. According to $I$ vs $\sqrt{v}$, $I$ vs $v$ and log $I$ vs log $v$ graphs and related equations in 0.1 M H2SO4, acetate buffer at pH 5.5 and phosphate buffer at pH 7.75, the process was found as diffusion controlled.

Model pharmaceutical compounds were used for identifying and discuss the electrochemical oxidation mechanism of epirubicin as details. Daunomycin, doxorubicine, idarubicine and mitoxantrone were selected as model compounds since their structures can enlighten electrochemical mechanism of epirubicin.

References